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The Kashrut of Cultured Meat¹

Approved on November 14, 2017 by a vote of 21-1-0. Voting in favor: Rabbis Pamela Barmash, Noah Bickart, David Booth, Elliot Dorff, Baruch Frydman-Kohl, Susan Grossman, Reuven Hammer, Josh Heller, David Hoffman, Jeremy Kalmanofsky, Jane Kanarek, Jan Kaufman, Gail Labovitz, Amy Levin, Jonathan Lubliner, Daniel Nevins, Micah Peltz, Avram Reisner, David Schuck, Ischah Waldman, Ellen Wolintz-Fields. Voting against: Rabbi Paul Plotkin.

Question:

May cultured meat—also known as *in vitro*, clean or lab-grown meat—be considered kosher?

Response:

In the summer of 2013, Dr. Mark J. Post, a medical researcher at Maastricht University in the Netherlands, made headlines by presenting the world's first hamburger made of “cultured meat,” a product developed in a lab from a sample of skeletal stem cells taken from a live cow.² Dubbed the “\$325,000 Burger,” this product clearly was not close to reaching market, yet as a proof of principle, it dramatized the potential of cultured meat, which had been discussed for many decades.³ By 2016 companies such as [Memphis Meats](#) had announced their intention to

The Committee on Jewish Law and Standards of the Rabbinical Assembly provides guidance in matters of halakhah for the Conservative movement. The individual rabbi, however, is the authority for the interpretation and application of all matters of halakhah.

¹ In this responsum I refer to the traditional *in vivo* form of producing meat by raising animals for slaughter as “pastured meat,” and the proposed *in vitro* method of creating meat from cells in laboratories as “cultured meat.” There are also an increasing number of vegetable-based, meat-like products, such as [Beyond Meat](#) and the [Impossible Burger](#), which is made with the protein leghemoglobin and plant ingredients. These, like proposed synthetic biology products, avoid nearly all the issues of this paper other than whether meat-like products should be considered to be meaty for ritual purposes. See the final section.

² See “[Building a \\$325,000 Burger](#),” by Henry Fountain, published on May 12, 2013 in *The New York Times*. Dr. Mark J. Post graciously reviewed a draft of this responsum and offered helpful comments and corrections for which I am deeply grateful. I have also benefited from the advice of Dr. Robert Pollack of Columbia University.

³ For an introduction to the technology and history of developing cultured meat see the Wikipedia article, “Cultured Meat,” https://en.wikipedia.org/wiki/Cultured_meat. *The Journal of Integrative Agriculture* published a special issue (14:2) on cultured meat in 2015. New scholarly and news articles are being published each month. See too the commercial web sites of the Good Food Institute, <http://www.gfi.org/why>, and New Harvest, <http://www.new-harvest.org/faq>. Jeff Bercovici gives a thorough [profile of Memphis Meats in the webzine Inc.](#)

bring “clean meat” to market within five years, and an Israeli start-up called [SuperMeat](#) claimed to be close to producing kosher cultured chicken.⁴ In May, 2017 Technion University in Haifa hosted a conference called “[Future Meating](#),” dedicated to clearing the path to the commercialization of cultured meat.

There are many technical, financial, and aesthetic challenges to be addressed before such meat reaches the table, but the halakhic issues deserve clarification early in the process. First, what are the general arguments advanced on its behalf? Proponents of cultured meat make numerous claims:

- *Ethics.* Conventional methods for producing meat cause animal suffering at each stage of the process. Cultured meat would not involve a nervous system, and thus there would be no animal suffering.
- *Health.* Pastured meat often contains antibiotics and growth hormones, as well as contaminants such as Salmonella and E Coli, that can be harmful to humans and animals which consume them in large quantities. Cultured meat would be cultivated in sterile conditions with no need for such additives and a lower risk of contamination. It might also be possible to include healthful components such as fat tissue rich in omega-3 fatty acids.
- *Environment.* Animals raised for meat pollute the environment through their waste-products, particularly the emission of carbon dioxide and methane, which is a potent greenhouse gas. Cultured meat would be cleaner to produce because there would be no excrement or emission of methane (a by-product of rumination and fermentation involved in raising cattle for pastured meat).
- *Ecology.* The vast tracts of land and quantities of freshwater currently dedicated to livestock production could instead be used to cultivate diverse fruits and vegetables, enriching human nutrition; fields could also be fallowed and returned to nature. Wildlife could benefit from the reduction of herds and flocks raised for meat (since many wild animals are killed during hay harvesting).⁵
- *Energy efficiency.* Although there is not yet a commercial operation producing cultured meat that can be critically assessed, cultured meat’s proponents claim that in ideal

⁴ See <http://www.theatlantic.com/health/archive/2016/09/is-lab-grown-meat-kosher/500300/> .

⁵ See the July 29, 2016 report of The Nature Conservancy, “[U.S. Beef Supply Chain: Opportunities in Fresh Water, Wildlife Habitat, and Greenhouse Gas Reduction](#),” p. 50.

conditions it should require far less energy to produce than does the system of raising animals (especially cattle) for slaughter and then butchering them for sale. These claims have been challenged in the scientific literature; it is too early to know how the efficiency debate will be settled.⁶

Halakhah addresses these general concerns under classical rubrics such as minimizing animal suffering (צער בעלי חיים), promoting human health (ונשמרתם מאוד לנפשותיכם), and protecting the environment (בל תשחית).⁷ While these categories have been greatly expanded in contemporary Jewish discourse, perhaps beyond the point of connection to their classical contexts, the declared goals of developing cultured meat appear to be consonant with traditional Jewish norms and values.

Rather, our halakhic concerns will focus on production methods, specifically questions such as the species of animal used as a source of cells to culture meat, the prohibition of removing a limb or even flesh from a living animal, the kashrut of ingredients used in the growth medium and as additives for flavor, texture and shelf-life, and the ritual valence of the final product—whether it should be considered to be “meat” in halakhic terms, or rather neutral (*pareve*).⁸

On the meta-level, these questions all point to a broader one of identity transmission. To what extent do subsequent generations of a cell line inherit the qualities of their genetic ancestors? We are accustomed to viewing biological organisms as related to their ancestors and

⁶ In 2011, Hanna L. Tuomisto and M. Joost Teixeira de Mattos predicted that the environmental impact of cultured meat production would be far lower than any conventional forms of meat production: “Despite high uncertainty, it is concluded that the overall environmental impacts of cultured meat production are substantially lower than those of conventionally produced meat.” See *Environ. Sci. Technol.*, 2011, 45 (14), pp 6117–6123. A more cautious subsequent assessment from *Environ. Sci. Technol.*, 2015, 49 (19), pp 11941–11949 is available [here](#). See too Carolyn S. Mattick, et al, “[A Case for Systemic Environmental Analysis of Cultured Meat](#),” *Journal of Integrative Agriculture* 2015, 14(2): 234–240. They argue that a systematic energy-use comparison should take account of the non-meat uses made of animal carcasses—feathers, skins etc. which would need to be replaced by other synthetic products. Nevertheless, Memphis Meats claims in its [Feb. 1, 2016 press release](#), “While generating one calorie from beef requires 23 calories in feed, Memphis Meats plans to produce a calorie of meat from just three calories in inputs. The company’s products will be free of antibiotics, fecal matter, pathogens, and other contaminants found in conventional meat.” It has been suggested that cultured meat might become an important component of feeding the rapidly growing human population, but it is too early to verify such a claim.

⁷ For halakhic sources and discussion of these concepts please see my responsum, “[Halakhic Perspectives on Genetically Modified Organisms](#),” pp.10-12 with notes, and conclusions on p.44. This responsum was approved by the CJLS on November 10, 2015.

⁸ The Israeli Zomet Institute’s journal *Tehumin* has published a series of halakhic studies, critiques and rejoinders over the past three years in volumes 34-36. To start, see Zvi Ryzman: 99- ע' (תשע"ה), ע' 112. For subsequent *Tehumin* articles and a study by J. David Bleich in *Tradition*, see below.

yet also as distinct entities that are shaped by their environment. This is even more true on the cellular level. The field of epigenetics has demonstrated that environmental factors play an enormous role in gene expression;⁹ viruses may alter an organism's DNA over the course of one generation. The cellular modifications at play with cultured meat are prodigious, with transformations between stem and differentiated states changing the structure of the units. Indeed, cells altered in a lab environment may not be recognizable to the original animal's immune system.¹⁰ We must remain cognizant of this reality when considering whether subsequent generations of cells should be assigned the halakhic attributes of the first cells taken from a live specimen. Let us begin our halakhic inquiry with the source—must the original cells used to produce cultured meat come from a kosher animal?

טהור—טהור מן הטהור—*That which comes from the pure is pure.*

The first step in creating cultured meat is to collect a sample of stem cells from a living animal; these cells are manipulated in a lab setting called a bioreactor to induce proliferation. They are then coaxed into differentiating to form muscle fibers and are subjected to tension in order to develop into tissue that can be layered into meat.¹¹ Living cells may also be harvested immediately after (kosher) slaughter, which would have halakhic implications, but is not the

⁹ For an overview of epigenetics see the [Wikipedia article](#), and citations in notes 85-86 of my GMO responsum. Siddhartha Mukherjee offers an excellent presentation on the significance of epigenetics in *The Gene: An Intimate History* (NY: Scribner, 2016), pp.392-410. I discuss the implications of gene editing systems such as CRISPR/Cas9 briefly below. See Jennifer A. Doudna and Samuel H. Sternberg, *A Crack in Creation: Gene Editing and the Unthinkable Power to Control Evolution* (NY: Houghton Mifflin Harcourt, 2017).

¹⁰ Dr. Post explained (personal communication, Sept. 9, 2016) that patients who undergo an autologous transplant—that is, they have bone marrow or even an organ removed and then returned to their body—may experience organ rejection of their own cells. When cells are removed from a body they change, and are not necessarily recognized by the immune system when they “come home.” He writes, “A possible explanation is that epi-genetic changes occur that alter the phenotype of the cells. There may be other reasons that we do not know of right now.”

¹¹ Dr. Post described the process as follows (personal communication, Sept. 9, 2016): “The cells that we are using for cultured meat are designated stem cells, meaning that they are already somewhat differentiated towards muscle cells, yet they are still sufficiently undifferentiated to be able to proliferate. Once they stop proliferating (because we starve them), they will differentiate into mature muscle fibers. The first step in that process is that they merge to become multinucleated myotubes. The myotubes, when given sufficient biochemical and mechanical cues, will then mature into muscle fibers usually after performing some form of labor. It is our intention to make muscle fibers that are biochemically and microscopically indistinguishable from real muscle, so that they likely also have the same taste and mouthfeel. Still, if you would implant this muscle fiber back in the same cow that donated the stem cells, it would probably be recognized as being ‘foreign.’”

For now, the focus is on creating thin strips of muscle tissue, which are then layered to form a product resembling ground beef. It would also be possible to culture a multi-layered product comparable to a steak, but that would require a synthetic circulatory system to deliver nutrients and oxygen and to remove waste. There is also preliminary discussion of using 3-D printing to create complex tissue.

anticipated practice. In the future, it may be possible with synthetic biology to recreate the muscle and fat cells that comprise meat entirely from non-biological sources (which, like plant-based meats, would obviate most of our concerns), but for now, cultured meat is being designed to derive from a live animal source.

Because the resultant “edible biomass,” or meat will never have been part of an animal, the established signs of kosher species (split hooves and rumination for mammals; fins and scales for fish; traditional identification of birds) will not be observed. However, the harvested cells may be compared to eggs and milk which are collected from a fully formed specimen and inherit the species status of their source. True, the harvested cells are microscopic and are not edible in the normal sense. Still, the comparison to eggs is apt given that yolks are essentially large cells produced by a live animal which may be fertilized for the sake of reproduction, eaten, or put to some other use. The stem cells mined from a live animal likewise have the capacity to be used in any of these ways, albeit with significant technological assistance.

Eggs produced by a kosher bird or fish are considered kosher, whereas eggs produced by a non-kosher bird or fish are not kosher. This rule is derived by the rabbis from the “extra” word בת in the list of non-kosher birds in Leviticus 11:16 and Deuteronomy 14:15: ואת בת היענה, “and the ostrich.” While the sages in b. Hullin 64b discuss if בת is not merely part of the name of the ostrich, from the apparently extraneous word they derive a ban on ostrich eggs:¹²

אמר חזקיה: מנין לביצת טמאה שהיא אסורה מן התורה? שנאמר: ואת בת היענה, וכי בת יש לה ליענה? אלא איזו זו ביצה טמאה.

Hezekiah says: what is the source that teaches that the egg of an impure bird is biblically forbidden? For it says: “and the daughter of the ostrich.” Does the ostrich have a daughter [i.e. a chick born hatched]? Rather what is this—an impure egg.

Likewise, milk from a kosher mammal is permitted for kosher consumption, whereas milk from a non-kosher mammal is forbidden (the exception being human breast milk).¹³ This rule comes to be known in halakhah as יוצא מן הטמא/האיסור (that derived from an impure/forbidden source is

¹² A parallel midrash in Pesikta Zutrata to Shmini (31a), emphasizes that this applies to *all* impure species of bird: *“And the daughter of the ostrich--This “daughter” is the ostrich’s egg. This variant comes to teach that the eggs of all impure birds [are not kosher].”*

¹³ The rabbis at b. Bekhorot 6b derive from the Torah’s repetition of the ban on eating camels that not only their flesh but also their milk is forbidden. See also SA YD 81:5. Only infants are permitted directly to nurse human breast milk, but if a woman expresses milk into a cup it may be drunk by an adult. It is not considered to be truly “dairy,” but still may not be eaten with meat because of misleading appearances (מראית עין). Bee honey is permitted because it is considered by halakhic sources to be a secretion not of the animal, but rather of the flowers, and because bee parts like legs that break into the honey are deemed detrimental to taste, and also because the permission of bee honey is deemed a biblically mandated exception. See Tosafot to Avodah Zarah 69a, s.v. ההוא.

also impure).

Mishnah Bekhorot 1:2 opens with the status of offspring that do not resemble the species of their mother (presumably because of cross-species hybridization). If such an animal is considered to be “pure” (like a cow) and it is a first-born, then it would need to be turned over to the Temple, whereas if it is deemed impure (like a donkey) and is a first-born, then it would need to be redeemed, with the proceeds donated. The Mishnah next considers whether the subsequent offspring of a “pure” animal may be considered kosher to be eaten, even if it does not resemble its “pure” parent:

ומה הם באכילה? בהמה טהורה שילדה כמין בהמה טמאה מותר באכילה, וטמאה שילדה כמין בהמה טהורה אסור באכילה, שהיוצא מהטמא טמא והיוצא מן הטהור טהור.

What about for the purposes of eating? If a pure animal gives birth to one resembling an impure species, [the offspring] is permitted for eating. If an impure animal gives birth to one resembling a pure species, [the offspring] is forbidden for eating. That which emerges from the impure is impure, and that which emerges from the pure is pure.

Based on this mishnah, its discussion in b. Bekhorot 6a-7b, and the sources we have seen regarding eggs, Rambam prohibits any food that derives from an impure animal:

כל מאכל היוצא ממין מן המינין האסורין שלוקין על אכילתן הרי אותו המאכל אסור באכילה מן התורה, כגון חלב בהמה וחיה הטמאים וביצי עוף ודג הטמאים שנאמר ואת בת היענה זו ביצתה. והוא הדין לכל האסור כיענה ולכל הדברים הדומין לביצה.¹⁴

Any food which emerges from one of the forbidden species that one is to be whipped for eating it—this food is biblically forbidden to eat. For example: milk from impure domesticated and wild beasts, and eggs from impure birds and fish. For it says, “and the daughter of the ostrich” — this refers to its eggs. And this rule applies to any [animal] that is forbidden like the ostrich, and for all things similar to eggs.

Our sages at b. Bekhorot 7a debate the kashrut of animal by-products such as donkey urine which, repulsive as it may sound, was apparently used in some ancient food preparations.¹⁵ Rosh considers donkey urine to be biblically banned, whereas Rambam permits it (as implied in the halakhah above that forbids only “any food” from an impure species). Rabbi Karo in Beit

¹⁴ רמב"ם הלכות מאכלות אסורות פרק ג, הלכה א.

¹⁵ The culinary use of urine, though not from donkeys, is still practiced in China. See Dan Levin’s article, “[Recipe for a Ritual Chinese Dish: Eggs, Time and Plenty of Urine](#),” *New York Times*, July 22, 2016.

Yosef (YD 81) and Shulhan Arukh (YD 81.1) sides with the Rosh to prohibit even this non-food product under the rubric of, “that which emerges from an impure animal is impure.”¹⁶

Based on the principle that derivatives of non-kosher animals—milk, eggs, edible skins and even urine—are not kosher, we are led to conclude that regarding cultured meat too, the kashrut status of the animal *species* is significant. It is true that taking a biopsy of cells is quite different from the natural process of collecting bird eggs or milking cows, but it is not more invasive than is the taking of meat, skin or bones. *Simply put, cells from a non-kosher species may not be used to produce kosher food.*

Rabbi J. David Bleich (56-58) gives a less simple explanation, citing Rabbi Chaim Soloveitchik in differentiating between two forms of יוצא, or substances that separate from the original animal.¹⁷ The first he applies to the flesh of the original animal and of its descendants, which is forbidden in Lev. 11:8 and Deut. 14:8 under the expression לא תאכלו, “do not eat from their flesh.” The second form of יוצא refers to derivative products such as milk and eggs. Rambam in “Forbidden Foods” 3:6 says that eating the flesh of forbidden animals calls for the penalty of being lashed, while eating forbidden milk and eggs incurs a less severe whipping for rebelling against rabbinic authority (מכת מרדות), even though the act is itself biblically banned.¹⁸ Rabbi Bleich claims that the cells harvested to culture meat would be the latter form of יוצא, separation, like milk and eggs. However, this is not an obvious conclusion since the cells’ source is “flesh,” and so too is their intended end. To paraphrase Rabbi Shimon b. Lakish in b. Pesahim 84a, בתר בסוף אזלינן, we should consider the final intended result.¹⁹ Rabbi Soloveitchik said of eggs and milk בשר מין בשר, that “they are not a kind of meat,” but it would be difficult to say this of a tissue sample taken from a cow that is cultured to make a hamburger. Like us, Rabbi Bleich generally understands that cells taken from a kosher species may be compared to other substances produced by living animals such as milk and eggs, and be permitted. Curiously, he

¹⁶ רמב"ם הלכות מאכלות אסורות פרק ד הלכה כ. עור הבא כנגד פניו של חמור מותר באכילה מפני שהוא כמו הפרש ומי רגלים שהן מותרין, יש עורות שהן כבשר והאוכל מהן כזית כאוכל מן הבשר, והוא כשיאכל אותן כשהן רכים. +/השגת הראב"ד/ עור הבא כנגד פניו. כתב הראב"ד ז"ל א"א/ רב ששת פשט להו לאיסורא במסכת בכורות ממתני, עכ"ל. ובשולחן ערוך יורה דעה הלכות בהמה וחיה טהורה סימן פא סעיף א. חלב בהמה וחיה טמאה או טריפה, וצירה ומי רגליה אסורים כבשרה. ויש מי שמתיר במי רגליה (רמב"ם פ"ד ד"כ). אבל מי רגלים דאדם, לדברי הכל, מותרים.

¹⁷ Rabbi Chaim Soloveitchik of Brisk, *Hiddushei ha-Gra al ha-Rambam, Hilkhot Ma'akhalot Assurot* 3:11. This theory is also discussed by R' Yehudah Bezael Spitz at the beginning of his *Tehumin* (v.35, p.193) rebuttal to Rabbi Ryzman in *Tehumin* v.34. See also Rabbi Spitz's English article, “The Halachic Status of Genetically Engineered Meat,” in *Tradition* #72 (2016), pp.56-80 (on this point, p.66f).

¹⁸ רמב"ם הלכות מאכלות אסורות פרק ג הלכה ו. אף על פי שחלב בהמה טמאה וביצי עוף טמא אסורין מן התורה אין לוקין עליהם. שנאמר מבשרם לא תאכלו על הבשר הוא לוקה ואינו לוקה על הביצה ועל החלב, והרי האוכל אותן כאוכל חצי שיעור שהוא אסור מן התורה ואינו לוקה אבל מכין אותו מכת מרדות.

¹⁹ תלמוד בבלי מסכת פסחים דף פד עמוד א. איתמר, גידין שסופן להקשות. רבי יוחנן אמר: נמנין עליהן בפסח, ריש לקיש אמר: אין נמנין עליהן בפסח. רבי יוחנן אמר: נמנין עליהן, בתר השתא אזלינן. ריש לקיש אמר: אין נמנין עליהן, בתר בסוף אזלינן.

does not address a major consideration of ours and other halakhic researchers, the way in which the cells are removed from the living specimen.

אבר מן החי, A Limb Taken From a Living Animal

The prohibition on eating a limb taken from a living animal (hereafter, “the limb ban”) is derived by the sages from three or four verses in the Torah. Bavli Sanhedrin at 57a and 59a-b cites Genesis 9:4, where God tells Noah and his children:

אַךְ בֶּשֶׂר בְּנִפְשׁוֹ דָמוֹ לֹא תֹאכְלוּ:

You must not, however, eat flesh with its life-blood in it.

Bavli Hullin 102b presents a debate between Rabbi Yoḥanan and Reish Lakish.²⁰ Both agree that the limb ban is based on Deuteronomy 12:23, where Moses warns Israel,

רַק חֹמוֹק לְבִלְתִּי אֶכֶל הַדָּם כִּי הַדָּם הוּא הַנֶּפֶשׁ וְלֹא תֹאכַל הַנֶּפֶשׁ עִם הַבֶּשֶׂר:

But make sure that you do not consume the blood; for the blood is the life, and you must not consume the life with the flesh.

These two sages derive similar laws from Exodus 22:30, where God commands Israel,

וְאַנְשֵׁי קִדְשׁ תִּהְיוּ לִי וּבֶשֶׂר בִּשְׂדֵה טְרֵפָה לֹא תֹאכְלוּ לְקֶלֶב תִּשְׁלַכְוּ אֹתוֹ:

You shall be holy people to Me: you must not eat flesh torn by beasts in the field; you shall cast it to the dogs.

Rabbi Yoḥanan argues that the Deuteronomy text also establishes a ban on *בשר מן החי*, “flesh from a living animal,” while the Exodus text refers to the ban on *טריפה*, eating from a carcass killed by other animals in the field. Rabbi Shimon b. Lakish derives both the second and third rules from the Exodus text. In either case, the limb ban is located by these sages in Deuteronomy 12:23, and both agree that there is an additional “flesh ban” against eating meat taken from a living creature, even if it does not meet the rabbinic definition of a limb. The “flesh ban” is also derived from Ex. 22:30 based on the Onkeles Aramaic translation, *“ובשר תליש מן חיה לא תיכלון, “You shall not eat flesh torn from an animal.”* Such meat is considered to be forbidden as *טריפה*, “torn” if the animal is mortally wounded in the process but has not yet died.

The Exodus verse, which speaks of “meat from the field,” reinforces the idea that these

²⁰תלמוד בבלי מסכת חולין דף קב עמוד ב. אמר ר' יוחנן: לא תאכל הנפש עם הבשר - זה אבר מן החי, ובשר בשדה טרפה לא תאכלו - זה בשר מן החי ובשר מן הטרפה, ור"ש בן לקיש אמר: לא תאכל הנפש עם הבשר - זה אבר מן החי ובשר מן החי, ובשר בשדה טרפה לא תאכלו - זה בשר מן הטרפה. אכל אבר מן החי ובשר מן החי; לר' יוחנן - חייב שתיים, לר"ש בן לקיש - אינו חייב אלא אחת; אכל בשר מן החי ובשר מן הטרפה, לר"ש בן לקיש - חייב שתיים, לר' יוחנן - אינו חייב אלא אחת; אכל אבר מן החי ובשר מן הטרפה - לדברי הכל חייב שתיים.

bans apply only to land animals, not to fish (or permitted grasshoppers). Fish do not require ritual slaughter, and their blood is not forbidden. As such they are not protected from being eaten alive, though to do so would be considered cruel conduct and forbidden under the rubric of *צער בעלי חיים*, causing excessive suffering to animals, and also as a repugnant behavior banned under the category of *בל תשקצו*, “you shall not draw abomination upon yourselves” (Lev. 11:42).^{21,22}

Finally, a *beraita* cited in Bavli Nazir 53b²³ bases the limb ban on Numbers 19:16, a text regarding ritual purification following corpse contamination:

וְכָל אֲשֶׁר יִגַע עַל פְּנֵי הַשָּׂדֶה בַּחֲלָל חֶרֶב אוֹ בְּעַצְמוֹ אָדָם אוֹ בְּקִבְרֵי יְטֵמָא שְׁבַעַת יָמִים:

And in the open, anyone who touches a person who was slain by sword, or who died naturally, or human bone, or a grave, shall be unclean for seven days.

The limb ban is understood by the rabbis to be one of the *שבע מצוות בני נח*, seven universal commandments given to all descendants of Noah, that is, to all people, which was then repeated and included within the Sinaitic revelation to Israel. In b. Sanhedrin 59b, we read:

אמר רב יהודה אמר רב: אדם הראשון לא הותר לו בשר לאכילה, דכתיב לכם יהיה לאכלה ולכל חית הארץ - ולא חית הארץ לכם. וכשבאו בני נח התיר להם, שנאמר כירק עשב נתתי לכם את כל. יכול לא יהא אבר מן החי נוהג בו - תלמוד לומר אך בשר בנפשו דמו לא תאכלו.

Rav Yehudah says, citing Rav: Adam the First was not permitted to eat meat, for it says, “To you and to the beasts of the earth are [the fruits of the field] given to eat” (Gen. 1:29-30)—but the beasts of the earth are not given to you. When the children of Noah came, [God] permitted [meat] to them as it says, “As with the green grasses I give you all these” (Gen. 9:3). Is it possible that [the ban on] limbs from living creatures would not apply [to the Noahites]? Thus it says, “You must not, however, eat flesh with its lifeblood in it” (Gen. 9:4).

The proof-text for the limb ban as applied to gentiles comes from Genesis, not from one of the post-Sinaitic verses. It is extended to Israel based on the verse in Deuteronomy, and also on rabbinic logic. Midrash Sifre Devarim to *Re'eh* (Piska 76) states:

²¹ שולחן ערוך יורה דעה הלכות שחיטה סימן יג. בהמה, חיה ועוף טעונין שחיטה; דגים וחגבים אין טעונין שחיטה. הגה: ומותר לאוכלם מתים או לחתוך מהם אבר ולאכלו, אבל אסור לאכלן חיים משום: בל תשקצו.

²² Nevertheless, on this basis Rabbi Yaakov Ariel recommends that cultured meat be taken only from fish, thereby removing from consideration both the limb ban and the ban on mixing meat and dairy products. See *Tehumin* v.36, p.454.

²³ תלמוד בבלי מסכת נזיר דף נג עמוד ב. דתניא: וכל אשר יגע על פני השדה בחלל חרב או במת - על פני השדה - זה המאהיל על פני המת, בחלל - זה אבר מן החי ויש לו להעלות ארוכה...

ולא תאכל הנפש עם הבשר, זה אבר מן החי, והלא דין הוא מה בשר בחלב שמותר לבני נח אסור לישראל אבר מן החי שאסור לבני נח אינו דין שאסור לישראל, יפת תואר וכל הדומים לה תוכיח שאסורה לבני נח ומותרת לישראל אף אתה אל תתמה על אבר מן החי שאף על פי שאסור לבני נח שיהא מותר לישראל תלמוד לומר ולא תאכל הנפש עם הבשר זה אבר מן החי, רבי חנניה בן גמליאל אומר זה הדם מן החי.

And thou shall not eat the life with the flesh (12:23): This refers to a limb cut from a living animal. But is it not obvious that if flesh seethed in milk, which was permitted to all descendants of Noah, was (later) forbidden to Israel, the limbs of a living animal, which was forbidden to all descendants of Noah, should certainly be forbidden also to Israel? (Not necessarily so,) as evidenced by the case of the (captive) *woman of goodly form* (Deut. 21:11), who was forbidden to all descendants of Noah but was (later) permitted to Israel, and by other similar cases. You should therefore not be surprised if the limb of a living animal, too, were (later) permitted to Israel although previously prohibited to all descendants of Noah. Hence, *Thou shalt not eat the life with the flesh*, referring to the limb of a living animal. R. Hanina ben Gamliel, however says: This refers to the blood of a living animal.²⁴

The rabbis first seek to extend the limb ban to Jews based on the premise that Jewish law is always stricter on Jews than on gentiles. Contending with contrary evidence, they switch tactics to establish an independent biblical source of the limb ban that is indisputably addressed to Israel.²⁵

Indeed, in several senses the limb ban is considered by the rabbis to be more severe for gentiles than for Jews. Gentiles are prohibited to tear a limb from any land animal, whereas for Jews the prohibition applies only to “pure” species that they are permitted to eat.²⁶ For example, if a limb were torn from a pig, it would be forbidden to a gentile under the limb ban, but for the Jew only under the pork ban.²⁷ Moreover, according to Rambam, the system of minimum measurements established by the rabbis as a threshold for liability on eating forbidden foods

²⁴ Translation taken from *Sifre: A Tannaitic Commentary on the Book of Deuteronomy*, translated from the Hebrew by Reuven Hammer (New Haven: Yale UP, 1983), pp.130-131. In note 5, Rabbi Hammer refers to b. San. 56a and t. AZ 8:4ff for sources on the “woman of goodly form” being sexually permitted only to the initial Israelite conquerors of Canaan, not to Jewish soldiers generally. This biblical “leniency” of allowing the rape of captives was in any event restricted by the rabbis to that generation, and forbidden to gentiles and all later Jewish soldiers.

²⁵ Christine Hayes discusses the Bavli’s use of the Noahide laws to intensify the differentiation between Jews and non-Jews towards the end of her book, *What’s Divine About Divine Law?* (Princeton UP, 2015), pp. 361-365. See too her discussion of the Sifre Devarim source and other parallels.

²⁶ See m. Eduyot 6:3. t. Eduyot 2:10, b. Hullin 102a, *et al.*

²⁷ It has been suggested that this might be an instance of the principle *קים ליה בדרכה מיניה*, whereby a person who is found liable for a severe punishment is relieved of liability for a more lenient category. Still, it is not evident to me that the limb ban is less severe than is the pork ban. Both are biblically forbidden to Jews, with full liability triggered by consumption of an olive’s bulk. Another possibility, אין איסור חל על איסור, will be addressed below.

applies only to Jews.²⁸ Thus the limb ban takes effect for Jews only when an olive's bulk of forbidden flesh is consumed, whereas for gentiles even a tiny amount is prohibited. Still, this is a theoretical distinction, since the meat remains forbidden for everyone.

There is a discussion in classical sources about whether one act of cutting a limb from a live animal could simultaneously violate as many as three prohibitions. In b. Hullin 103a, a case is imagined in which the flesh sample is a) taken from a live animal, which b) was mortally wounded in the process, and c) the flesh was itself forbidden fat. Is the transgressor in triple jeopardy? The medieval commentators debate the consequences (see novella of Rashb" a for a summary). In our case, however, the cell collection does not constitute a limb, the source animal is not permanently injured, and the targeted cells are skeletal stem cells, not forbidden fats.

Moreover, the halakhic principle of אין איסור חל על איסור, *one act is not punishable for more than one prohibition*, would tend to rule out an accretion of bans (there are exceptions, as when the acts are simultaneous).²⁹ For example, if a non-kosher species (such as a pig) were slaughtered in a non-kosher fashion, then a Jew who ate the meat would be punishable only for eating the forbidden species, not also for eating meat lacking *shehitah* (kosher slaughter). In our case, if the species is kosher, and the cells are not from inherently forbidden fat or blood, then the active prohibition would be against eating flesh from a live animal.

With many halakhic food prohibitions—such as on mixing meat and milk, and *hametz* during *Pesah*—the ban covers not only eating the food, but also *הנאה*, *benefiting* from owning it. However, the limb ban is limited at b. Pesahim 22b to *eating* because of the comparison to blood. Deut. 12:23 emphasizes רק חֶזֶק לְבִלְתִּי אֶכֶל הַדָּם, “but make sure that you *do not eat* the blood,” which is understood by the rabbis to imply permission of benefit.³⁰ In addition, the verse in Exodus speaks of throwing such food to the dogs (possibly one's own pets), which may indicate that flesh from a living animal may be used so long as a person does not eat it.³¹

What constitutes the limb that it is forbidden to detach from a living animal? The sages discuss two types of “limb.” One is a body part which includes flesh, bone and sinew, such as a

²⁸רמב"ם הלכות מלכים פרק ט. וכן חייב על אבר מן החי, ועל בשר מן החי בכל שהוא, שלא ניתנו השיעורין אלא לישראל בלבד, ומותר הוא בדם מן החי.
²⁹ This principle appears in many places in the Bavli. For example, Pesahim 35b, Yevamot 13b and 32a, Hullin 100-101, and 113-114. In Rambam MT see *Forbidden Foods* 14:18, and *Forbidden Liaisons* 17:8.

³⁰ תלמוד בבלי מסכת פסחים דף כב עמוד ב. והרי אבר מן החי, דכתיב לא תאכל הנפש עם הבשר, ותניא, רבי נתן אומר: מנין שלא יושיט אדם כוס יין לנוזיר, ואבר מן החי לבני נח - תלמוד לומר ולפני עור לא תתן מכשל. הא לכלבים - שרי! - שאני אבר מן החי, דאיתקש לדם. דכתיב רק חזק לבלתי אכל הדם כי הדם הוא הנפש. רש"י שם. מה אבר מן החי אסור - באיסור האמור בו, אף דם מן החי - אסור באיסור האמור בו, כלומר: כרת משום דם גמור, מהו דתימא: רק חזק לבלתי אכול הדם - אוזבחת מבקרך ומצאנך דכתיב לעיל קאי, ודם זביחה הוא דאסור, אבל דם הקזה מותר.

³¹אנציקלופדיה תלמודית כרך א, אבר מן החי [המתחיל בטור קב] אבמה"ח מותר בהנאה, ואפילו להסוברים שכל מקום שנאמר "לא תאכל" איסור הנאה בכלל, מכל מקום אבמה"ח למדים בהיקש מדם: רק חזק לבלתי אכל הדם וגו' ולא תאכל הנפש עם הבשר, מה דם מותר בהנאה, אף אבמה"ח כן. ולהסוברים שאבמה"ח למדנו מבושר בשדה טרפה, למדין היתר הנאתו מהכתוב בו: לכלב תשליכון אתו.

hand or leg. Another type of “limb” is actually an organ which is entirely “flesh,” such as the tongue, spleen, kidney etc. The limb ban seems to apply only when the entire limb is removed. Some say that to elicit punishment, the entire limb must be eaten, but the halakhah sets a minimum for Jews at consumption of an olive’s bulk of any part before liability is established.

As we have seen, there is a related ban on *בשר מן החי*, “flesh from a living animal.” Rashi on Hullin 102a states that this concept bans consumption of a limb, even if it lacks an olive’s bulk of flesh, and of an olive’s bulk of flesh, even if it does not constitute a limb.³² Rambam rules this way in chapter 5 of his Laws of Forbidden Foods, and is followed by later codifiers. Here is the summary given by Rabbi Yaakov b. Asher in the Tur (YD 62):

לא תאכל הנפש עם הבשר אזהרה לאוכל אבר מן החי ונוהג בבהמה וחיה ועוף ואינו נוהג אלא בטהורים לפיכך אבר הפורש מן החי בין שיש בו בשר וגידין ועצמות בין שאין בו אלא בשר לבד כגון הלשון והטחול והכליות והביצים אסור לאוכלו בין אם יש בו כזית בין אם אין בו כזית וכן בשר הפורש מן החי אסור אף על פי שאין בו משום אבר מן החי אסור משום ובשר בשדה טריפה לא תאכלו.

“You must not consume the life with the flesh” (Deut. 12:23). This warns not to eat a limb from a living animal. It applies to cattle, beasts and birds, but only to pure species. If a limb is removed from a living animal, whether it has flesh, sinews and bones, or whether it is only flesh, such as the tongue, spleen, kidneys and testicles, it is prohibited to eat it whether there is an olive’s bulk or not.³³ And likewise flesh removed from a living animal is prohibited even if it is not considered to be a limb from a living creature; it is prohibited because of the verse, “you must not eat flesh torn by beasts in the field” (Ex. 22:30).

There is a surprising line of rabbinic thought that were it not for explicit biblical permission to drink milk and eat eggs, these products of live animals would be forbidden under the rubric of the limb ban. They, and only they, are biological products permitted for consumption even when collected from live animals.³⁴ As such, eating cells removed from a live animal would clearly violate the limb ban, though if the quantity remained below the threshold of an olive’s bulk, the

³² רש"י מסכת חולין דף קב עמוד א. במשהו בשר וגידין ועצמות - משלימין לזית דמשום טומאה לא מחייב דאין בגידין ועצמות טעם טמא ומשום אבר מחייב דלהכי פלגינהו קרא לאבר מן החי ובשר מן החי דמחייב אאבר אף על גב דאין שיעור בשר ואבשר אף על פי שאינו אבר.

³³ In his *Drishah* commentary [#3], Rabbi Yehoshua Volk questions why the Tur seems to dismiss the Talmud’s measure of an olive’s bulk found at the bottom of Hullin 102a (see Rashi there, and Rambam, MT Forbidden Foods 5:3). *Drishah’s* explanation is reasonable: any amount is forbidden, but liability for corporal punishment is limited to transgressors who eat an olive’s bulk.

³⁴ See sources in *Encyclopedia Talmudit*, v.23, column 306, esp. b. Bekhorot 7b, and Tosfot, Hullin 64a-b, s.v. שאם and discussion below regarding Rabbi Sha’ar Yashuv Cohen on *d’var hadash*.

ban might be reduced to a rabbinic level.

Rabbi Zvi Ryzman completely dismisses the prohibition of *בשר מן החי*, “flesh from a living animal” because, he notes, the targeted cells are stem cells, not muscle tissue. He points to the famous statement in b. Yevamot 69b that during the first forty days of gestation, a human fetus is considered *מיא בעלמא*, as “simply water,”³⁵ a classification which is cited in several modern responsa to permit early-term abortions even in non-life-threatening circumstances.³⁶ Rabbi Ryzman then argues that the stem cells taken by biopsy from a cow or other animal permitted for kosher consumption in order to culture meat are comparable to the cells found in an early term human fetus. On this basis he claims that stem cells are not considered “alive” but rather, “just water,” and thus not “flesh” that could trigger either the limb ban or the flesh ban. He concludes,

על כן נראה שתא הנלקח מבהמה טהורה אינו נחשב ל"אבר מן החי" או ל"בשר מן החי", "שכן הוא "מיא בעלמא" ואינו אבר או בשר.

Therefore it appears that a cell taken from a pure animal is not considered to be “a limb from a living animal” or “flesh from a living animal,” for it is actually “just water,” and is not a limb or flesh.³⁷

While a human fetus before 40 days may be largely unformed, and is indeed not considered by halakhah to be an independent life until birth, the cow from which stem cells are harvested is very much alive in the world. Moreover, when technicians take a biopsy from an animal, they remove many types of cells at once, not only stem cells, and only later isolate them. The stem cells taken are mature, not embryonic.³⁸ Indeed, it is not evident that cultured meat may be developed only from stem cells. Other types of cells, including fibroblasts, may be used as the foundation for the growth of the trillions of cells required to produce an edible form of meat.

In response to his critics in the journal *Tehumin*, Rabbi Ryzman reiterates his position in

³⁵ תלמוד בבלי מסכת יבמות דף סט עמוד ב. והתניא: בת כהן שנישאת לישראל ומת - טובלת ואוכלת בתרומה לערב! אמר רב חסדא: טובלת ואוכלת עד ארבעים, דאי לא מיעברא - הא לא מיעברא, ואי מיעברא - עד ארבעים מיא בעלמא היא.
³⁶ שו"ת חוות-יאיר, ס' לא, ושו"ת ציץ אליעזר, חלק ז' ס' מח, א, ח.

See Rabbi Susan Grossman's 2001 responsum, [Partial Birth Abortion and the Question of When Life Begins](#), p. 16.

³⁷ תחומין שם, ע' 103.

³⁸ Dr. Post confirms this characterization: “They are adult stem cells and already have undergone differentiation towards mature cells, although they still maintain their proliferative capacity. It is also true that we inevitably harvest more cells than just the stem cells. Collateral catch consists primarily of mature skeletal muscle cells and they will die rapidly and thus are NOT used for growth. Other cells in the collateral catch, such as fibroblasts will have a function in the culture and can grow and mature (forming sinewy stuff).” Personal communication, August 30, 2016.

v.36, extrapolating from a text focused on human development *in utero* to the context of flesh removed from a mature cow for the sake of forming meat, but this is not convincing.³⁹ It does not appear that calling biopsied cells “simply water” will suffice to permit their consumption.

Rather, another approach seems preferable. It is forbidden to eat even a minute amount of flesh taken from a living animal, but with cultured meat, *there is no intention to consume the source cells themselves*. The act of “eating” is said to involve הנאה גרון, *pleasure in the throat*,⁴⁰ but these cells will never be placed in a human throat, and would be undetectable if they were. They certainly do not meet the halakhically significant threshold of נותן טעם, *giving flavor*.

Like most cells, these will eventually degrade and die. Far more significantly, the final product is extremely unlikely to contain remnants of the original stem cells. It is only much later—after their descendant cells will have transformed from stem into muscle and fat cells, multiplied by the trillions within a growth medium, and been structured under tension to form strips of muscle tissue and then layered into meat—that an edible product will emerge. By one estimate, from ten source cells it could be possible in ideal conditions over two months to culture 50,000 tons of meat.⁴¹ Muthuraman Pandurangan and Doo Hwan Kim have claimed that a billion pounds of *in vitro* meat could be produced from one animal.⁴² Even if such estimates are wildly optimistic, in any given portion of the end-product it is exceedingly unlikely that there will be consumption of the actual source cells taken from an animal.

Although it is theoretically possible that one or more of the original cells might survive into the final product and be unwittingly eaten by someone, liability for the limb ban for Jews is triggered only with the consumption of an olive’s bulk. A kosher consumer could be confident (at the level of one in many hundreds of trillions) that the cultured meat they consume will contain no cells that ever lived in an animal. Mishnah Makhshirin establishes that when an unmarked piece of meat is most likely to be kosher, then it may be assumed to be kosher.⁴³ In our case, any portion of cultured meat is extremely unlikely to contain one of the original source cells.

³⁹ Rabbi Yaakov Ariel (*Tehumin* v. 36, pp. 452-3) says דינם כבשר רגיל, “their status is like ordinary meat,” but Rabbi Ryzman reiterates his claim starting at p.455. Even Rabbi Ze’ev Weitman, who is receptive to Rabbi Ryzman’s conclusions, declines to defend this most bold of his arguments (v.36, p.458f).

⁴⁰ עיין שו"ת משנה הלכות חלק טו סימן קז. וכל שאין הנאת גרון לא מקרי אכילה ללקות עליו.

⁴¹ <http://www.dailymail.co.uk/sciencetech/article-2087837/Test-tube-meat-reality-year-scientists-work-make-profitable.html>.

⁴² A [novel approach for in vitro meat production](#), *Applied Microbiology and Biotechnology*, July 2015, Volume 99, Issue 13, pp 5391-5395.

⁴³ משנה מסכת מכשירין פרק ב. מצא בה בשר הולכין אחר רוב הטבחים אם היתה מבושלת הולכים אחר רוב אוכלי בשר מבושלת:

Moreover, we have the oft-cited argument of Rabbi Yehiel Mikhel Epstein (1829-1908), author of *Arukh Ha'Shulhan*, regarding the kashrut implications of microscopic organisms that are prevalent in rainwater and in the air. He concludes, האמת הוא דלא אסרה תורה במה שאין העין שולטת, "In truth, the Torah did not forbid anything that the [naked] eye cannot perceive, for the Torah was not given to angels..."⁴⁴ If a stem cell taken from the original animal makes it to the final consumer product, blended in with trillions of new cells, it will be impossible to identify, impossible to taste, and of no halakhic consequence to the consumer, for whom it would be as undetectable as any microscopic organisms found in food.⁴⁵

However, we ought not rely on Rabbi Epstein's argument altogether to dismiss the significance of the original biopsied cells. His exclusion was focused on the unavoidable ingestion of microscopic organisms when drinking water and breathing air, not on the expert manipulation of cells by scientists in the lab (a distinction first made by Rabbi Auerbach).⁴⁶ Those cells, harvested from a living animal, *derive their species identity* from that animal, whether they are fertilized and bred into a full specimen, or cultured to develop a mere component such as muscle tissue. There will be no kosher pork chop.

Rabbi J. David Bleich struggles to reconcile the general dismissal from halakhic consideration of subvisual phenomena with the fact that current biotechnology allows technicians working on the microscopic level to create macroscopic results (like a hamburger).⁴⁷ He cites Rabbi Auerbach's responsum to expand the realm of responsibility to include subvisual actions intended to result in visual results.

⁴⁴ ערוך השולחן יורה דעה סימן פד סעיף לו. The reference to angels is in turn derived from the Talmud, e.g. b. Brakhot 25b. See further discussion of this source in my responsum on genetic engineering, p.32. Rabbi Auerbach makes a similar argument in permitting drinking from the Kineret on Pesah even if there is bound to be a microscopic amount of *hametz* present in the water.

⁴⁵ The principle of nullification is meant for "after the fact" application, בדיעבד, not as an initial plan, לכתחילה. The *Tehumin* authors give extensive attention to the implications for the nullification process of non-Jews performing this act with the awareness that Jews may benefit from it (and even offer kosher certification). Rabbi Bleich closes with the paradox that cultured meat might be considered kosher *only if it lacks kosher certification*. Rabbi Ryzman argues that because there is *only a doubt of forbidden meat* (since he believes the stem cells are not meat), therefore nullification may be invoked even beforehand. His critics have their stringent responses. However, these arguments seem quite unnecessary since my understanding is that the original cells which were taken from a live specimen will not survive into the final product, and the descendant cells created in a lab are not considered to be live limb meat. If such a cell were to survive, it would be unexpected, בדיעבד and therefore subject to nullification after the fact.

⁴⁶ עיין שו"ת מנחת שלמה תנינא (ב - ג) סימן ק ד"ה בענין שאלתו: כיון שאנשים מטפלים בחלקיקים האלה ומעבירים אותם ממין אחד לשני הרי זה חשיב ממש כנראה לעינים ולא דמי כלל לתולעים שאינם נראים.

⁴⁷ J. David Bleich, "[Stem Cell Hamburgers](#)" in *Tradition*, 46:4 (2013), pp.48-62.

Rabbi Bleich further suggests (54) that Rabbi Auerbach's observation may be related to the halakhic concept known as *אחשביה* ("ascribed value"). That concept is that some actions may not initially be regulated by Jewish law unless they come to be associated with a specific forbidden result.⁴⁸ This resembles discussions within Shabbat laws regarding intention—the same act might be either permitted or forbidden, depending on the clarification of intention. In this way, Rabbi Bleich arrives at a defense of the halakhic significance of microscopic interventions that are intended to yield macroscopic results. While not all of his reasoning resonates with us (he gives credence to the notion that pre-modern rabbis had microscopic vision), the general conclusion is similar (we will return to this concept below).

Rabbi Ryzman includes the microscopic effects exclusion in his list of factors that may cumulatively remove cultured meat from a prohibited status. Rabbi Yaakov Ariel has published an extensive and stringent critique of Rabbi Ryzman's original article in *Tehumin* 36, waiving aside the permission based on the dismissal of microscopic phenomena. He writes, *אך מכיון שתאים קטנים אלו לקוחים מבשר הניכר לעין, מתרבים ומקבלים ממדים גדולים הניכרים לעין, דינם כבשר רגיל. ומכיון שמקורם בבשר* "But because these small cells that were taken from flesh that is visible to the eye, reproduce and assume large proportions that are visible to the eye, their legal status is like regular flesh. And because their source is from forbidden meat, so too is the product that inherits their status, like the forbidden source."⁴⁹

Rabbi Ariel's argues that the passage of a product through a microscopic stage does not inherently annul the significance of the visible source and edible end-product. Rabbi Auerbach first made this declaration, and I argued for it in my 2016 paper on genetic engineering. A broad-spectrum declaration that nothing microscopic has halakhic significance is counter-intuitive and counterproductive in an era when scientists regularly work on this level. Even if a formalistic halakhic approach might set aside the significance of these stem cells, a values-informed approach such as mine will take them, their source, and their destiny seriously. If the microscopic realm were to be declared beyond the jurisdiction of halakhah, then many of humanity's most consequential decisions would be denied the insights of our ancient and profound tradition. Our approach therefore is not to dismiss the significance of all microscopic

⁴⁸ See for example the entry in the Talmudic Encyclopedia:

מושגים תלמודיים. אחשביה. דבר שאין לו חשיבות עצמית, ומקבל חשיבות על ידי מעשה האדם או מחשבתו. לדוגמא: המוציא בשבת מרשות לרשות, אינו חייב אלא אם כן הוציא כשיעור שקבעו חכמים לכל דבר ודבר לפי חשיבותו. ברם, אם הוציא, למשל, מין ממיני הזרעים שהצניעו קודם השבת לשם זריעה, או שהוציא דבר שהצניעו כדי להראותו כדוגמא, או לרפואה - חייב אפילו אם אין בו כשיעור שקבעו חכמים, מפני שהחשיבו. דוגמא נוספת: דם שנקפא מאליו - אין חייבים על אכילתו, משום שאכילה שלא כדרכה היא, שהרי דם אינו עומד לאכילה אלא לשתייה, אבל אם הוא הקפיא את הדם, החשיבו, וחייב על אכילתו.

We will return to *אחשביה* below regarding gelatin.

⁴⁹ הרב יעקב אריאל, כשרותו של בשר מתורבת, תחומין לו (תשע"ו) ע' 447.

manipulations, but rather to establish which forms of identity are retained by subsequent cell-line generations, and which forms of identity are erased.

The Question of Identity Across Generations מה טיבו של זה?

Although we have found precedent for maintaining the *species identity* of cells derived from permitted and forbidden animals, just as is done with milk from mammals, and eggs from birds and fish, it is reasonable to ask how much individual history those source cells convey with them. Species identity across generations is compelling for several reasons. First, this is the default position of both biology and halakhah, summed up nicely in the Mishnah at Bekhorot 1:2: *that which comes from a pure species is pure and that which comes from an impure species is impure*. Second, we might compare the live DNA preserved in these cells to the halakhic concept of דבר המעמיד, a “sustaining substance.”⁵⁰ In rabbinic sources this is a minute additive that nevertheless has a pronounced, durable and readily discernible impact, such as rennet on cheese or gelatin on gelatinous foods.⁵¹ The live DNA from the original cells is of course not an additive, but given that it is but one ingredient in the recipe for making cultured meat, and that it persists in the subsequent generations, conveying to them the particular qualities of the species from which they were collected, the comparison is apt. From these cells an entire new specimen could be created bearing the hallmarks of its parent species.⁵² Even though DNA itself is not visible to the naked eye, its effect certainly is, and thus it has the status of בעין, something which may plainly be detected.

If species identity can be preserved across the generations, what about other attributes of the source cells? If the original cells were cut from a live animal, do the successor cells inherit the status of “torn flesh,” even though they were never part of a living specimen? This is a fundamental question. Those who would apply the limb ban to descendant cells—a trillion or more cells cultured from an original animal cell—are claiming that the descendants are identical to the source, not only in genotype but in phenotype. This is false on both scientific and halakhic grounds.

Biologically, the successor cells are transformed by their own “experience” — the material environment in which they are nurtured, differentiated, and multiplied. They have transformed

⁵⁰ עיין דברי רמ"א בשו"ע יו"ד ס"ס פ"ז.

⁵¹ אנציקלופדיה תלמודית כרך ו, דבר המעמיד [המתחיל בטור תקס]. כחו של דבר המעמיד הוא שניכרת פעולתו בדבר שניתן לתוכו, וכאילו בכל חלק מן התערובת הוא ניכר, ולכן הוא חשוב כאילו ישנו בעין.

⁵² “Rudimentary egg and sperm cells made from stem cells: A feat achieved for the first time in humans could be a step towards a cure for infertility” by David Cyranoski, published in *Nature*, December 24, 2014. See:

<http://www.nature.com/news/rudimentary-egg-and-sperm-cells-made-from-stem-cells-1.16636> .

cell type, grown in a distinct environment, and become far removed in generation and experience from the animal in which the first cells grew. They do not bear a “flesh memory” of the original cells,⁵³ and as Dr. Post has observed, the descendant cells might not be recognized by the original animal’s immune system were they to be returned by autologous transplant. The DNA may be the same, but everything else is different. They are like eggs collected from a chicken—the same DNA, but different substance and halakhic status.

It is possible that a gene editing technology such as CRISPR-Cas9 will be employed to modify the DNA of the harvested cells. This could be done to increase yield by modification of the *myostatin* gene (whose mutation leads to a condition called “double muscling”),⁵⁴ or perhaps to augment the nutritional content of the meat. The halakhic concept of a “novel entity,” דבר חדש is usually applied to a substance that has passed through an inedible state, but in this case the product would be modified at the genetic level, so that the descendant cells might arguably be deemed a new substance.⁵⁵ However, single-gene modifications do not suffice to change the species identity of the organism. Further, Mark Post says that sensitivities about GMOs, which are heightened in Europe, argue against the use of gene editing of the cells.⁵⁶

Halakhic concerns are not necessarily satisfied by scientific findings of fact. It is helpful, when possible, to connect contemporary phenomena to established categories that have settled law, even if the fit is not perfect.⁵⁷ Rabbi Yaakov Ariel finds a fascinating precedent in the realm of tithed grain. In chapter 9 of Mishnah Terumot there is consideration of the status of crops grown from tithed seeds that had been dedicated for the exclusive use to priestly families, or from seeds that were supposed to have been left for the poor. By the third crop-generation the

⁵³ The field of epigenetics studies the heritability of genomic change by means of DNA methylation and histone modifications. Yet the fundamental biological fact of variation down the generations remains intact. Siddhartha Mukherjee summarizes this reality in *The Gene*, p.407: “Genomes and epigenomes exist to record and transmit likeness, legacy, memory, and history across cells and generations. Mutations, the reassortment of genes, and the erasure of memories counterbalance these forces, enabling unlikeness, variation, monstrosity, genius, and reinvention—and the refulgent possibility of new beginnings, generation upon generation.”

⁵⁴ See Jennifer Doudna and Samuel Sternberg, *A Crack in Creation*, pp.130-34.

⁵⁵ The CJLS passed and published a series of responsa on the definition of *davar hadash* in the 1980s. See Kassel Abelson, “The Kashrut of Mono- and Di-Glycerides” and again, with Mayer Rabinowitz, “Definition of a Davar Hadash,” where the standard of forming new chemical compounds is the accepted threshold.

⁵⁶ Personal communication, June 27, 2017. It will be interesting to see if researchers based in the United States, China, Israel etc. will likewise refrain from editing the genes of cells to be used to manufacture cultured meat.

⁵⁷ Christine Hayes provides a fascinating treatment of the relationship between realism and nominalism in rabbinic literature in chapter 5 of, *What’s Divine about Divine Law*, “The ‘Truth’ About Torah.” In the Bavli, the sages seem sensitive to criticisms and even mockery that their rulings are not “reality-based,” but rather built on a foundation of fictitious assumptions. At times, they make accommodations to observed reality instead of asserting their authority to declare, “left to be right.” Still, legal systems do ultimately depend upon precedent, and so we seek early sources in which to ground our approach to novel phenomena such as our subject.

plants lose the status of the first generation, at least for annual plants (בדבר שזרעו כלה, lit. *something whose seed desists*). Regarding perennials (דבר שאין זרעו כלה, lit. *something whose seed persists*), which may produce several seasons of fruit from one seed, the later generations inherit the ritual status of the source. Rabbi Ariel points to Mishnah 9:6 to prove that later generations of seed may inherit the ritual status of their source. This is hardly the only explanation—our Sages could simply have made an enactment to discourage sinners from “burying the evidence” of their illicit retention of grain. Still, Rabbi Ariel concludes that cultured meat grows exclusively from the power of the original cells, מיניה וביה בלבד, and therefore the product is the equivalent of the source. If the original cells were forbidden as “torn meat” or limb meat, then the subsequent generations would be precisely the same.

To strengthen his point, Rabbi Ariel argues that while seeds of grain depend on other factors such as the soil and its nutrients to grow, and thus lose their identity by the third generation, the cells of cultured meat depend *entirely* on the source cells, and thus later generations are undiminished in their inheritance. But this is patently false—without receiving nutrients in the lab, the cultured meat will never reproduce. Rabbi Ze’ev Weitman critiques Rabbi Ariel, arguing that stem cells in their growth medium are precisely like seeds planted in the ground:

ולכאורה נראה, שהדברים כן דומים, שהרי בדיוק כמו שהאדמה מספקת לצמח את חומרי המזון הדרושים לו כדי להתפתח ולגדול כך בדיוק קורה גם בבשר המתורבת – שם הגידול וההתפתחות מתאפשרים הודות לחומרים המותרים שמזינים את התא ומשמישים לו מצע גידול, ואם הצמח שגדל ומתפתח מהזרע נחשב לפנים חדשות הרי נראה שהוא הדין גם הבשר הגדל ומתפתח מהתא יכול להיחשב כפנים חדשות.⁵⁸

However, it appears that the matters are indeed comparable, for just as the earth provides a plant with the nutrients needed for it to grow and develop, exactly so with cultured meat—there the growth and development are made possible due to the materials that nourish the cell and serve it as a growth platform. And if a plant which grows and develops from a seed is considered to be a new entity (lit. *new face*) it would appear that so too meat which grows and develops from a cell may be considered like a new entity.

Rabbi Weitman is correct in drawing a more direct comparison between the cells of cultured meat and plants grown from seeds of tithed or untithed produce. The source cells alone cannot reproduce to create the descendant product. We may apply to them the halakhic

⁵⁸ הרב זאב וייטמן, בשר מתורבת, תחומין כרך לו, ע' 459.

principle *זה וזה גורם*, *both factors are necessary*—for the new cells to grow, and thus even if one element is forbidden, this ban is not conveyed to the end-product.⁵⁹

We would go further and say that the stem cells are comparable to a plant whose seed desists—the original cells will die, and only with intensive interventions from lab technicians will new cells grow and develop in the desired fashion. Therefore, the model from replanted tithes fails to establish the transmission of ritual status between generations of cells.

To conclude this section, the easiest argument for inherited identity relates to *species status*. Germline cells from a species convey the same qualities to their genetic heirs, even with the mutations that attend all reproduction. The DNA is like a sustaining substance, and the species identity is reproduced at the cellular level. Culturally too we recognize later generations of plants and animals as belonging to the same species even with the minor variations that are readily observed. However, it is less coherent to claim that later generations of cells should inherit the *ritual status* of “torn meat” (טריפה) from their source cells, which themselves have long since perished. The later generations of cells never were connected to a living animal, even as later generations of plants were not part of the original physical plant. In other words, *cells that are cultured over time to produce beef remain identified with the same species of cow, but not with the experience of the specific cow or cows from which they ultimately derived, just as ears of barley lose the ritual tithing status of earlier generations, while remaining barley.*

As we have seen (b. Pesahim 22b), while there is a comprehensive prohibition on *eating* the limb or flesh or blood taken from a living animal, there is no prohibition on *benefiting* from it. These microscopic cells may be cultured in a lab setting to produce muscle cells and other components that will eventually resemble meat. The harvesting process will not render the original animal as “mortally wounded” and so as Rema taught, there is no true limb ban, but only a stringency. And even if the original flesh should be forbidden as a stringency, the amount taken is less than the olive’s bulk that is forbidden to Jews. And even if we nevertheless forbid the cells since non-Jews have a stricter standard, this would apply only to the original cells, not to the trillions of descendants. These later cells are the product of many inputs—DNA from the source, and nutrients from the growth medium. All aspects are essential; this triggers the principle of *זה וזה גורם* and renders the final product as permissible.

⁵⁹ On this important halakhic principle, see b. Pesahim 26-27, Sanhedrin 80b, et al, and in the codes, MT Avodah Zarah 7:14 and SA YD 142:11. For example, vegetables planted beneath an “Asherah” (idolized tree) benefit from the forbidden shade of the Asherah, but also depend on the permitted soil. Without the soil there would be no vegetables, and so the vegetables are completely permitted even though they have benefitted from illicit shade. Likewise with our case—even if the source cells could transmit their limb ban to descendant cells, the medium is what allows those cells to grow, and (assuming a kosher growth medium), the final product should be permitted.

Therefore, the derivative cells do not inherit the prohibited status of flesh torn from a living being. However, given that all of the derivative cells come from the same species as the parent and could in fact be used to reproduce an entire animal, they retain the species-status of the original specimen, just as milk and eggs do. Cultured meat from a cow, but not from a pig, may be made kosher. What, however, about the other ingredients that might be part of this product?

גותן טעם לשבח, Non-Kosher Additives

How does one develop an edible biomass (i.e., meat) of trillions of cells from just a few original stem cells? Technicians embed these cells within a sponge-like matrix that is perfused with a culture medium that provides nutrients and growth factors. The most common recipe⁶⁰ for such a medium contains an additive of fetal bovine serum, which is generally non-kosher.⁶¹ Gels used in Petri dishes are often made from porcine sources. Plant-based replacement additives are possible and desirable to the general consumer for various reasons: they have the potential to be cheaper, are safer from infectious agents, and are preferable for vegetarians. Should livestock be drastically reduced as a result of meat being mostly cultured there would no longer be an adequate source of serum.⁶² However, plant-based media may introduce allergenic factors. This problem will require attention by commercial producers, but is not a kashrut concern.

Dr. Mark Post has made progress in developing a vegetarian growth medium; without

⁶⁰ Dr. Mark Post reports that fetal bovine serum is “usually 5-20% of the medium, the rest of the medium consisting of 300 defined components such as water, amino-acids, sugar, minerals and vitamins.” Personal communication, August 30, 2016.

⁶¹ Many kosher species such as larger fish may eat non-kosher species before themselves being captured and consumed. This does not affect the kosher status of the predator (though if one finds a forbidden animal within the stomach of a permitted animal, the forbidden item may not be eaten. See תלמוד ירושלמי (וילנא) מסכת תרומות פרק ח: כן ר' (חייא בשם ר' יוחנן השוחט בהמה ומצא בה שקץ אסור באכילה מה טעמא [דברים יד ו] בהמה בבהמה תאכלו ולא שקץ בבהמה תאכלו). One might argue that here too, the bovine fetal serum is like a food for the cultured meat in that it is metabolized by the muscle tissues, and not retained as a distinct ingredient in the final product. However, the growth medium is *intentionally* added by the producer as part of the production process, and it seems therefore that it might be considered an ingredient. Moreover, as Rabbi Spitz argues in *Tehumin* v.35, כבוש הרי זה כבוש, soaking kosher food in a forbidden substance (or vice versa) is like cooking them together, leaving both items non-kosher; the non-kosher serum would thus taint even kosher cells. (See b. Pesahim 76a, b. Hullin 97b, 111b *et al*; according to Rishonim, the soaking must be for 24 hours for the taste transfer to occur, unless the liquid is salt, brine or vinegar, in which case the transfer takes only six minutes) Given this concern, and that there are plant-based alternatives, and that animal sourced media may introduce health risks, it is clearly preferable to insist on vegetarian growth media.

⁶² It has also been noted that milk, leather and other animal products may likewise become less available should fewer animals be raised for meat. See Mattick, *et al* (2015).

this development, there would be little benefit to cultured meat since many cows would need to be slaughtered to provide the serum. Dr. Amit Gefen of Technion University has proposed using apples for the armature needed as a foundation for cultured meat. He told Ha'aretz, "Experience accumulated abroad shows that it is possible to grow cells from a mammalian source on apples because of the structure of their porosity. The pores are a sort of niches that provide the mammalian cells with a protected habitat in which the biological processes necessary for one day becoming a tasty piece of steak can occur."⁶³ Even with a plant-based armature, there will still need to be a medium to supply nutrients for cell growth.

It would be in the interest of the kosher consumer for cultured meat to be developed in an exclusively plant-based medium that is certified to be kosher. Rabbi Bleich (56-58), like Rabbi Ryzman, raises the halakhic principle discussed above of זה וזה גורם (both this and that are causative). If two factors are required to produce cultured meat, one permitted and a second forbidden (because of the limb ban), then there are grounds for leniency to permit the product. Thus even if the source cells were forbidden on some level, their inability to grow without the kosher medium would yield a permitted product. If both the source cells and the growth medium were deemed non-kosher, then so would be the end-product.

In order for cultured meat to mimic the pastured product and seem "meaty," it may be necessary to add ingredients to enhance taste, aroma, appearance, and bite, just as is done with soy and seitan-based meat products. These additives will also need to be kosher-certified. To win over the general public to this new form of meat, it may well be in the interests of producers for kosher supervisors to help certify that aside from the original cells mined from a live animal, the product is entirely vegetarian.

Would the use of fetal bovine serum in the currently common growth medium render the product inherently non-kosher? The finished product would be removed from the medium, or the reverse. Yet just as food that is cooked in a forbidden substance is forbidden, so too is food that is soaked in a forbidden substance according to the principle, כבוש הרי הוא כמבושל. True, the growth medium would not necessarily imbue the product, once removed, with its taste, either for good or bad, which leaves moot the traditional concern of a whether a non-kosher admixture is tasty (נותן טעם לשבה) or repulsive (נותן טעם לפגם). In the final form, any residual amount of medium left in the meat would certainly be less than 1/60 of the product volume and, because there was no intention to retain it, could be considered retroactively nullified (בטל בששים).⁶⁴

⁶³ <http://www.haaretz.com/science-and-health/premium-1.786281>.

⁶⁴ In his 1985 responsum, "[The Use of all Wines](#)," Rabbi Elliot Dorff cites an 18th century responsum of Rabbi Ezekiel b. Yehudah Landau (YD #26), who ruled that the bladder of a non-kosher fish could be used to clarify mead, and

Perhaps the very process of metabolizing the growth medium can be considered a form of nullification. Haifa chief rabbi Sha'ar Yashuv Cohen discusses the use of a wheat-based medium to grow mushrooms—could the mushrooms be considered as kosher for Passover?⁶⁵ He notes that in general, forbidden foods convey their prohibition to subsequent substances, unless there is a *חידוש*, *novel permission* implied by the Torah itself.⁶⁶ This is not the case here, but if the medium had been formulated before Passover, then the substance was not initially forbidden, and its products would not inherit a forbidden status. However, if the wheat-based product were indeed rendered *hametz*, would the mushrooms that were nourished by it also be forbidden? Or, could we say that the biochemical process of breaking down the growth medium effectively creates a new substance?

Rabbi Cohen compares this question to the status of an animal endowed with a gland that produces a fragrance that may be burned as incense, or even added to flavor food. The medieval sages concluded that this substance may be eaten, since the “blood” of the animal has been transformed by the animal itself into a permitted fragrance.⁶⁷ Rabbi Cohen concludes:

לפי זה לכאורה החמץ שנאכל ע"י פטריה ונפלט, הוא בודאי כבר חומר אחר, הר"ז לכאורה לא יותר גרוע מאשר דם שנאכל ע"י גוף של בעל חי והפך לבושם, ואזי יתכן שאפשר להתיר אותו.

Accordingly, the *hametz* that has been consumed by the mushroom and then secreted is certainly already a different substance. This is apparently no less so than the case of blood consumed by the body of an animal that is transformed into a fragrance, and thus it is possible to permit it.

Rabbi Cohen concludes his article by sharing that a corn-based alternative medium was identified, allowing his finding to go unimplemented. Having consulted with the great authorities of his time, however, he asserts that even the wheat-based medium would have been permitted. This argument could similarly be employed to nullify the halakhic significance of a

that this would not be considered בטל בששים לכתחילה, since the intention is not to enhance taste but to remove lees. This would be an additional precedent for allowing the use of non-kosher growth medium since the purpose is to allow the growth of the permitted product, and not to be consumed on its own.

⁶⁵הרב שאר ישוב כהן, הגדרת מושגי החמץ מבחינה מדעית והלכתית, ארחות 29, 10 – 5.

⁶⁶ He refers here to the bizarre rabbinic theory of דם נעכר ונעשה חלב, that milk is a derivative of curdled maternal blood that has been transformed by the mother's body from one substance to another. Milk should therefore be categorically forbidden, since it originates with a forbidden substance (blood), but it is permitted by biblical inference. Likewise, with honey—it is a secretion from a forbidden animal (bees) that has been rendered permitted only by biblical reference to its permitted consumption.

⁶⁷ The starting point is a reference at b. Brakhot 43a to a musk (מושק), whose gland was burned for incense. Medieval commentators Ba'al Ha'Meor and Rabbeinu Yonah debate whether the substance may be not only burned but also added to foods as an aromatic, concluding leniently, that the secretion should no longer be viewed as a derivative of forbidden blood. See discussion there in Rosh, #35.

forbidden growth medium such as fetal bovine serum, which is “consumed” by the muscle tissue. As with his case, however, we would do better with a medium whose kashrut status is permissible beyond doubt.

These arguments might lessen the severity of prohibition of a meat product cultured with animal-derived growth media such as fetal bovine serum. Still, such blood-based additives introduce new halakhic and health problems. For these reasons, it should be mandatory that growth media and all other additives to the cultured meat be animal-free in order for the product to be certified kosher.

Should Cultured Meat Be Considered “Meaty” from a Kashrut Perspective?

We have already learned that meat removed from a living animal, even a pure animal, is considered to be “*treife*” and is forbidden to be eaten.⁶⁸ If, however, the flesh taken from the animal is not itself eaten, but is rather used as a source to create new generations of cells, are those subsequent cells which have never themselves been part of a living animal considered to be meat? We have argued that they should not be considered “limb meat,” but are they meat altogether? Cultured meat will lack the features of an animal and not be subject to slaughter and inspection. It would be plausible to compare it to eggs laid by a live bird. They derive from an animal and in certain conditions would have the capacity to grow into an animal, but instead, they have been kept in a cellular state, and might be considered *pareve*, or neutral, like eggs or a vegetable. On the other hand, the end-product is intended to look, feel and taste like meat, and it will be biologically identical to meat. How could it be deemed *pareve*?

We may look for precedent to the discussions regarding rennet and gelatin, which were debated extensively by halakhists in the twentieth century.⁶⁹ These are substances derived from an animal source which are not themselves considered to be “meat” and have been found, after extensive processing, to be considered by some halakhic authorities to have become *דבר חדש*, a “novel entity,” and therefore neutral. In the case of rennet extracted from the lining of a calf’s stomach, there is precedent to consider the dried-out product to be “like wood.”⁷⁰ Moreover, the

⁶⁸ עייין ברמב"ם הלכות מאכלות אסורות פרק ד הלכה י. וכן החותך בשר מן החי מן הטהורים הרי אותו הבשר טריפה והאוכל ממנו כזית לוקה משום אוכל טריפה, שהרי בשר זה מבהמה שלא נשחטה ולא מתה, מה לי טרפה אותו חיה מה לי חתכה בסכין מה לי בכלולה מה לי במקצתה הרי הוא אומר ובשר בשדה טרפה לא תאכלו כיון שנעשית בהמה בשר בשדה הרי היא טריפה.

⁶⁹ Rabbi Isaac Klein addressed these subjects in chapters 6 and 7 of his book, *Responsa and Halakhic Studies* (NY: Ktav Publishing House, Inc., 1975), pp. 43-74. See sources in the first Ryzman *Tehumin* article, v.34, pp.107-108.

⁷⁰ בשו"ת גינת ורדים חלק יורה דעה כלל א סימן ד דין זה על סמך הבית יוסף [אבל כנראה לא מדויק בציטוט]: אבל לענין אכילה כיון שנתבשר הרבה פקע ממנו איסור אכילה כיון דהא מיהא לא חזי למיכל כשנתבשר הרבה וכבר כתבו הפוסקים דין זה ועיין בב"י ט"ד ס"ס ע"ז שכתב וז"ל כתוב בשבלי הלקט וז"ל עור קיבה שמולחין ומייבשין אותו ונעשה כעץ וממלאין אותו חלב מותר מאחר שנתייבש הוי כעץ בעלמא ואין בו לחוחית בשר עכ"ל. ועיין עוד בשו"ת רבי עקיבא איגר מהדורא קמא סימן רז: אמנם בג"ד כח דהתירא עדיף, כיון דמייבשים העור תחילה עד שנעשה כעץ. ליכא איסור בב"ה כלל.

rennet may be nullified in a volume of ingredients 60 times greater than itself.⁷¹ Regarding gelatin, the addition of toxic chemicals like hydrochloric acid have arguably removed the substance from the status of food and turned it into a new substance.⁷²

Rabbi Aharon Kotler considered whether in certain contexts gelatin should be considered “meaty” based on the principle of אהשבייה, ascribed status, and should not be cooked with dairy.⁷³ In his conclusion, however, he states that if gelatin were prepared from kosher slaughtered animals in kosher vessels, the end-result would be *pareve*: וגם להשתמש בתעשי' שמעורב בהם הז'עלאטין גם, “and even to use a mixing process which blends the gelatin with milk appears to me as permitted.”

Still, both gelatin and rennet pass through an inedible and even a toxic stage, whereas the cells gathered from a live animal will, despite all the manipulations, remain some sort of muscle cell. It is less plausible to dismiss the meaty status of a biological structure that never departs significantly from its original state.

There is also the precedent of chymosin, a microbial enzyme originally harvested from ruminant animals, but since 1990 cultured through recombinant genetic engineering. It is employed to produce kosher cheeses; chymosin itself is considered kosher and *pareve*.⁷⁴

Nevertheless, cultured meat is different—it is “flesh from the flesh.” If the biological structure of the product and the experience of eating it is deemed identical to that of eating pastured meat, then the principle of אהשבייה, ascribed status as meat, ought to be applied.

The discussion in Bavli Hullin (75b, and then Shulhan Arukh YD 13:2, 64:2 and its commentaries) of בן פקוע, a live calf fetus collected from the carcass of a slaughtered cow, is instructive on this point; if the animal is fully formed but has never touched the ground, it may be eaten based on the mother’s ritual slaughter, and its normally forbidden blood and fat could be considered permitted.⁷⁵ This establishes that the sages could conceive of a biological meat that is not in halakhic terms considered to be “meaty” because it has never lived an independent existence as an animal.⁷⁶ Still, the moment such an animal “touches ground,” it is deemed meaty. It seems that the sages are struggling to acknowledge the unique qualities of this unusual case

⁷¹ Once again, this principle applies only to after-the-fact cases, not to intentional use.

⁷² This paragraph paraphrases Klein, p.57. For a rather disturbing video documenting the process of turning pig skins into jelly candies see this [Belgian video by Aneeta Kneepkens](#).

⁷³ שו"ת משנת רבי אהרן סוף סי' טז. עיין ר' יהודה בצלאל שפיץ בתחומין כרך לה, ע' 196 שמצטט בטעות סי' טו.

⁷⁴ See Rabbi Kassel Abelson’s 1994 CJLS responsum, “[The Kashrut of Microbial Enzymes](#).”

⁷⁵ טור יורה דעה הלכות שחיטה סימן יג. השוחט בהמה ומצא בה עובר בין אם הוא בן שמונה או בן תשעה בין חי בין מת מותר ואין טעון שחיטה וחלבו מותר ודמו אסור. וה"מ דבן תשעה חי אין טעון שחיטה שלא הפריס ע"ג קרקע אבל הפריס ע"ג קרקע טעון שחיטה ראויה וכל שפוסל בשאר שחיטות פוסל בו וחלבו אסור וכו'. וראה בשו"ע יג סעיף ג, דברי ט"ז, וגם בסימן סד.

⁷⁶ I thank former CJLS secretary Rabbi Philip Gibbs for suggesting this source.

while nevertheless reestablishing the connection to conventional forms of eating in which meat is considered meaty. This resonates with our case.

An additional unusual “precedent” comes from the realm of rabbinic legend rather than halakhic sources, though the boundaries between the two are not always discernible. Most articles in the Jewish press on the halakhic possibilities of cultured meat mention two Talmudic legends involving miraculous meat.⁷⁷ In b. Sanhedrin 59b, a story is told of the sage Rabbi Shimon b. Halafta who, while walking on his way, was attacked by lions. He prayed for assistance, and two beasts fell from the sky. One was eaten by the lions, but Rabbi Shimon was able to collect the second and bring it to the Beit Midrash, where he raised the question of its kashrut. The answer was: *nothing impure comes from heaven*.⁷⁸ In another rabbinic legend at b. Sanhedrin 67a, Rabbi Hanina and Rabbi Oshaya were studying the mystical *Book of Creation* (ספר יצירה) and magically managed to create a third-grown calf.⁷⁹ The Talmud itself does not seem interested in the halakhic implications of this miracle meat. Does the animal require kosher slaughter? Is its flesh even considered meat? The implication is that this meat is kosher, but is it meaty?

Rabbi Ryzman cites the Torah commentary of Rabbi Isaiah Horowitz (של"ה) to Genesis 37:2,⁸⁰ as well as that of Rabbi Meir Leibush b"r Yehiel Michel Weiser (מלבי"ם) to Gen. 18:7 in light of the story of Rabbi Hanina and Rabbi Oshaya (Rabbi Bleich also focuses on this text). Malbim states that meat created from the *Book of Creation* is not like meat cut from an animal, and it may be eaten with milk. This is his explanation of how Abraham was able to offer meat and milk to his angelic visitors in Gen. 18—it was not natural meat, but “miracle meat.” After all, the text

⁷⁷ See for example: “Orthodox Groups Debate the Kashrut of Lab-Grown Meat,” by Sam Sokol, JTA, August 10, 2013: <http://www.jpost.com/Jewish-World/Jewish-News/Orthodox-groups-debate-kashrut-of-lab-grown-meat-322642>; (“Is the Lab-Created Burger Kosher?” by Yehudah Shurpin, published at Chabad.org:

http://www.chabad.org/library/article_cdo/aid/2293219/jewish/Is-the-Lab-Created-Burger-Kosher.htm; “Lab Grown Beef: But Is It Kosher?” by Yehuda Spitz, published in *Vos Iz Neias?* August 30th, 2013: <http://www.vosizneias.com/140201/2013/08/30/new-york-lab-grown-beef-but-is-it-kosher/>; as well as the Tehumin articles and R’ Bleich’s “Stem-Cell Burgers”.

⁷⁸ תלמוד בבלי מסכת סנהדרין דף נט עמוד ב. מי איכא בשר היורד מן השמים? - אין, כי הא דרבי שמעון בן חלפתא הוה קאזיל באורחא, פגעו בו הנך אריותא דהוו קא נהמי לאפיה, אמר: הכפירים שאגים לטרף. נחיתו ליה תרתי אטמתא, חדא אכלוה וחדא שבקוה. איתיה ואתא לבי מדרשא, בעי עלה: דבר טמא הוא זה או דבר טהור? - אמרו ליה: אין דבר טמא יורד מן השמים.

⁷⁹ תלמוד בבלי מסכת סנהדרין דף סז עמוד ב. אמר אביי: הלכות כשפים כהלכות שבת, יש מהן בסקילה, ויש מהן פטור אבל אסור, ויש מהן מותר לכתחלה. העושה מעשה - בסקילה, האוחז את העינים - פטור אבל אסור, מותר לכתחלה - כדרב הנינא ורב אושעיא. כל מעלי שבתא הוו עסקי בהלכות יצירה, ומיברי להו עיגלא תילתא ואכלי ליה.

⁸⁰ של"ה פרשת וישב מקץ ויגש דרך חיים תוכחת מוסר. והנה מצינו בגמרא (סנהדרין סה ב) דברא עגלא תלתא בכל ערב שבת על ידי עסק ספר יצירה בצירוף השמות, ובודאי זה הנברא על פי השמות ולא מצד התולדה אין צריך שחיטה, וניתר לאוכלו בעודו חי, וכך עשו השבטים. ויוסף לא ידע והיה סבור שהוא הנולד מאב ואם, הביא דבה זו אל אביו שהם אוכלים אבר מן החי, והם כנים היו וכדין עשו.

refers mysteriously to the “calf that [Abraham] had made.”⁸¹ Rabbi Ryzman suggests that biotech’s cultured meat might be comparable to the magical meat made by the Talmudic rabbis and even to Father Abraham using secrets from the *Book of Creation*, and therefore be classified as *pareve*. This is an entertaining suggestion, but it is difficult to rely on for a halakhic opinion addressing technological developments of our day that are remarkable and even astonishing, but are ultimately based on scientific methodologies. At the very least these stories demonstrate a rabbinic openness to accepting the kashrut of unnatural methods of meat production and the possibility of *pareve* meat. Still, it is implausible to cite these stories as precedents for applied law.

Based on what we have seen above, the source of cells used to create cultured meat must be kosher, just as the animal source of eggs and milk must be kosher in order for the derivative products to be acceptable for kosher consumption. The original cells harvested from a kosher animal may themselves be considered *treife* meat, and forbidden to eat, even though liability for a Jew is limited to a case in which the bulk of an olive in vivisectioned flesh is consumed. Moreover, we have learned that it is permitted to benefit from such cells, and we have argued that later generations of cells which were never part of the original animal should not be banned as part of its body. Likewise, because, the original cells were not part of a slaughtered animal carcass, they never became “meat.” Cell-generations after the initial harvest, and weeks, months or years later in the lab, muscle and fat cells will be formed into a tissue culture resembling meat, but these cells will never have seen the inside of an animal and might in principle be considered *pareve*.

However, we anticipate that it would be confusing for kosher consumers to differentiate between conventional pastured meat, which is “meaty” and may not be mixed with dairy products, and cultured meat, which if deemed *pareve*, could be mixed with any food. The concern of misleading impressions, מראית עין, could be triggered by a kosher cheeseburger. Rabbi Noah Bickart suggests⁸² that a similar concern may have convinced the ancient sages to ban placing poultry and dairy products on the same table lest Jews become casual and end up violating the rabbinic ban on eating them together (or the biblical ban on beef with milk).⁸³

True, kosher consumers have long since passed the stage of assuming that anything that

⁸¹ בראשית פרק יח, ו-ח. (1) וַיִּמְהַר אַבְרָהָם הָאֱהֱלָה אֶל שָׂרָה וַיֹּאמֶר מִהְרֵי שָׂרָה לֹוֹשֵׁי קִמְחָה סֶלֶת לֹוֹשֵׁי נְעָשִׂי עֲגוֹת: (2) וְאֵל הַבָּקָר רָץ אַבְרָהָם וַיִּקַּח בֶּן בָּקָר רֶף נְטוּב וַיִּתֵּן אֶל הַנְּעָר וַיִּמְהַר לַעֲשׂוֹת אֹתוֹ: (ח) וַיִּקַּח חֲמָאָה וְחֵלֶב וַיִּבֶן הַבָּקָר אֲשֶׁר עָשָׂה וַיִּתֵּן לַפְּנִיָּהם וְהוּא עֹמֵד עֲלֵיהֶם מִחַת הָעֵץ וַיֹּאכְלוּ: וּבְמַלְבֵּי"ם בְּרֵאשִׁית פֶּרֶק יח פֶּסוּק ז. וַיִּמְהַר לַעֲשׂוֹת אֹתוֹ שֶׁעָשָׂה אוֹתוֹ ע"י סֵפֶר יִצְרָה. נִרְאָה שֶׁרָצוּ לְתַרְץ בְּזוֹה אֵיךְ הָאֲכִיל לְהַמְלָאכִים בְּב"ח, וְאִמְרוּ שֶׁהִיָּה בָשָׂר שְׁנִבְרָא ע"י סֵפֶר יִצְרָה שְׂאִין לוֹ דִּין בָּשָׂר, וְז"ש שֶׁלִּקַּח חֲמָאָה וְחֵלֶב וּבִן הַבָּקָר אֲשֶׁר עָשָׂה, ר"ל יַעֲן שֶׁעָשָׂא ע"י סֵפֶר יִצְרָה הָיוּ יְכוּלִים לֵאכְלוֹ עִם חֵלֶב.

⁸² Personal communication, Aug. 25, 2016.

⁸³ עֵינֵין חוֹלִין קָד ע"ב. וּבְרַמְב"ם הַלְכוֹת מֵאֲכָלוֹת אֲסוּרוֹת פֶּרֶק ט הַלְכָה כ. אֲסוּר לְהַעֲלוֹת הָעוֹף עִם הַגְּבִינָה עַל הַשְּׁלַחַן שֶׁהוּא אוֹכֵל עֲלֵיו גִּזְרָה מִשׁוּם הַרְגֵל עֲבִירָה שְׂמָא יֹאכֵל זֶה עִם זֶה, אִף עַל פִּי שֶׁהָעוֹף בְּחֵלֶב אֲסוּר מְדַבְּרֵי סוֹפְרִים.

looks like meat or milk is what it appears to be. We regularly eat soy or wheat-gluten based “meat” at dairy meals, and *pareve* “milk” from soy, almonds, cashews, coconuts and other plants at meat meals. The task of keeping kosher now depends on kosher seals and supervisors to ascertain that there are no forbidden ingredients or mixtures of food.

A middle position is to argue that cultured beef is not “as meaty” as traditional pastured beef, since the cells of the final product were formed outside of an animal, and there is no need or possibility of slaughter, deveining, soaking and salting to remove non-existent blood. And yet, because the product is, in the end, muscle and fat tissue that is designed to be indistinguishable from traditional meat, it might be considered as “meat according to the rabbis,” somewhat like chicken. If so, then it too would be forbidden to eat with dairy products, but the prohibition would be of a lower level. Likewise, on days when Jews are instructed not to eat meat (the 9 initial days of Av), the ban might not apply to cultured meat.

In sum, we conclude that cultured meat ought to be regarded as “meaty” because, 1) we rule stringently on matters of possible biblical prohibition (ספק דאורייתא להורא), 2) in order to preserve the classical kosher separation of meat and milk, and 3) to avoid confusion so long as both forms of meat are on the market. Caution would dictate that cultured meat, which is intended to be identical in both substance and style to pastured meat, should be treated as “meat according to the rabbis,” in kashrut terms.

While a purely vegetarian or even vegan diet has many benefits, and may even comprise the morally ideal diet, most humans still seek to fill at least part of their protein requirement with meat. Meat is a significant part of many cultures and cuisines, including Judaism, which recommends meat consumption at Shabbat and festival meals. In the Talmud Rabbi Yehudah b. Beteirah claims that while the Temple stood, there was no joyous meal without meat, though without the Temple, “joy” can still be had with wine.⁸⁴ Rambam rules that on festivals even absent the temple there remains a need to eat meat in order to rejoice properly.⁸⁵ This should be understood as a culinary recommendation, not an absolute mandate to eat meat. Still, cultured meat, if developed as promised, has the potential to be a clean, compassionate and healthful source of protein which could augment the values of Jewish eating within a sustainable framework.

⁸⁴ תלמוד בבלי מסכת פסחים דף קט עמוד א. תניא, רבי יהודה בן בתירא אומר: בזמן שבית המקדש קיים - אין שמחה אלא בבשר, שנאמר וזבחת שלמים ואכלת שם ושמחת לפני ה' אלהיך. ועכשיו שאין בית המקדש קיים - אין שמחה אלא בייין, שנאמר וייין ישמח לבב אנוש.

⁸⁵ רמב"ם הלכות יום טוב פרק ו הלכה יח. והאנשים אוכלין בשר ושותין יין שאין שמחה אלא בבשר ואין שמחה אלא בייין.

Summary

The original cells removed from a live animal as a biological source for cultured meat are themselves forbidden for consumption under the rubric of “flesh from a live animal” (בשר מן החי). Normally, forbidden foods do not yield permitted food (יוצא מן האיסור). However, the severity of this ban is reduced for several reasons: 1) the amount of cells biopsied is below the threshold of an olive’s bulk (כזית) for which a Jew is liable; 2) the original cells will not persist into the final product except at a rate of “one in a trillion,” and in uncertain circumstances halakhah considers the most likely scenario (הולכין אחר רוב...); 3) the descendant cells are grown outside of the body and depend on more than one factor to multiply, rendering them permitted (זה וזה גורם); 4) the new cells will have been manipulated from stem to muscle or fat cells, and may also be edited to achieve desirable mutations such that they are no longer identical to the source cells—they are arguably a new substance with new features (דבר חדש, פנים חדשות). This final contention may be the weakest, since דבר חדש remains a controversial topic in halakhah, and after all, the cells remain identifiable with their source, and have not passed through an inedible or dead state. Still, with these four reasons, we conclude that the prohibition of eating flesh taken from a live animal does not apply to the final product of cultured meat.

As for the growth medium, even if blood products which are metabolized by the tissue might be considered transformed into a neutral new substance, vegetable-based growth media are preferable for reasons of both kashrut and avoiding the need for animal slaughter. A kosher growth medium will allow for a kosher end-product.

Species identity will be retained under the principle, “what comes from the pure is pure” (היוצא מן הטהור—טהור), and because the still active DNA may be considered a “sustaining substance” (דבר המעמיד). Cow cells may produce permitted cultured beef, but pig cells will produce still-forbidden cultured pork.

While it may be argued that cultured meat should be ruled *pareve*, this is a matter of doubt given that the skeletal muscle stem cells remain edible throughout the process, unlike gelatin or rennet, which are rendered inedible. Moreover, judging cultured meat to be *pareve* would cause confusion and undermine an important aspect of kashrut practice. The concept of “ascribed value” (אחשביה) indicates that we ought to compare cultured meat to traditional pastured meat (much as poultry was likened to beef) unless efforts to replicate the consistency and taste of meat fail. Finally, in matters of possible biblical prohibition we rule stringently (ספק דאורייתא לחומרא).⁸⁶ There will be no kosher cheeseburger, but meat which is sustainable and morally beyond

⁸⁶ ע"פ תלמוד בבלי מסכת ביצה דף ג עמוד ב, וכל ספיקא דאורייתא לחומרא.

reproach may yet be made available for kosher consumption.

פסקי דין

Halakhic Conclusions

- 1) Should cultured meat become a viable consumer product, it will be important to ascertain that it derives from a kosher species of animal and that the growth medium and any additives be plant-based or synthetic and certified kosher. Indeed, the entire process will require kosher supervision.
- 2) Cultured meat derived from cells taken from a kosher species of animal will not be prohibited as a limb or flesh taken from a living animal, because the original cells will not be eaten, and they alone would not suffice to create the final product.
- 3) While cultured meat might arguably be deemed *pareve* like eggs, this is a matter of doubt, and we rule stringently when in doubt over a biblical prohibition. Moreover, because the product is designed to mimic the biological structure and eating experience of pastured meat, it would be confusing for one meat to be “meaty” and another apparently identical meat to be *pareve*. Cultured meat should be designated as “meaty according to the rabbis” even though there will be no need for kosher slaughter, inspection for injury, deveining, soaking or salting to remove blood.
- 4) If cultured meat fulfills the promises of being less cruel to animals, less destructive to the environment, and more healthful to consume, then it will be not only acceptable, but even preferable to eating conventional pastured meat.

כנלע"ד

Rabbi Daniel S. Nevins
The Kashrut of Cultured Meat
Source Sheet

1. The Significance of Biological Origins

a. Deuteronomy 14:15 (cf. Levit. 11)

וְאֵת בֵּת הַיַּעֲנָה וְאֵת הַפִּתְחָס וְאֵת הַשֵּׁסֶף וְאֵת הַנֶּגֶז לְמִינֵהוּ:

The ostrich, the nighthawk, the sea gull, and the hawk of any variety [may not be eaten].

b. Bavli Hullin 64b.

אמר חזקיה: מנין לביצת טמאה שהיא אסורה מן התורה? שנאמר: ואת בת היענה, וכי בת יש לה ליענה? אלא איזו זו ביצה טמאה.

Hezekiah says: what is the source that teaches that the egg of an impure bird is biblically forbidden? For it says: “and the daughter of the ostrich.” Does the ostrich have a daughter? Rather what is this – an impure egg.

c. Mishnah Bekhorot 1:2

ומה הם באכילה? בהמה טהורה שילדה כמין בהמה טמאה מותר באכילה, וטמאה שילדה כמין בהמה טהורה אסור באכילה, שהיוצא מהטמא טמא והיוצא מן הטהור טהור.

What about for the purposes of eating? If a pure animal gives birth to one resembling an impure species, [the offspring] is permitted for eating. If an impure animal gives birth to one resembling a pure species, [the offspring] is forbidden for eating. That which emerges from the impure is impure, and that which emerges from the pure is pure.

d. Rambam, Laws of Forbidden Foods 3:1.

כל מאכל היוצא ממין מן המינין האסורין שלוקין על אכילתן הרי אותו המאכל אסור באכילה מן התורה, כגון חלב בהמה וחיה הטמאים וביצי עוף ודג הטמאים שנאמר ואת בת היענה זו ביצתה. והוא הדין לכל האסור כיענה ולכל הדברים הדומין לביצה.

Any food which emerges from one of the forbidden species that one is to be whipped for eating—this food is biblically forbidden to eat. For example: milk from impure impure domesticated and wild beasts, and eggs from impure birds and fish. For it says, “and the daughter of the ostrich” —this refers to its eggs. This rule applies to any [animal] that is forbidden like the ostrich, and for all things similar to eggs.

2. The Ban on Limbs and Flesh Taken from Live Animals, אבר מן החי

a. Genesis 9:4.

אֶךְ בֶּשֶׂר בְּנִפְשׁוֹ דָמוֹ לֹא תֹאכְלוּ:

You must not, however, eat flesh with its life-blood in it.

b. Exodus 22:30.

וְאַנְשֵׁי קִדְשׁ תִּהְיוּ לִי וּבֶשֶׂר בְּשֻׂדָּה טָרְפָה לֹא תֹאכְלוּ לְפֶלֶב תִּשְׁלַכּוּן אֹתוֹ:

You shall be holy people to Me: you must not eat flesh torn by beasts in the field; you shall cast it to the dogs.

c. Deuteronomy 12:23.

רַק חֲזֹק לְבַלְתִּי אֶכֶל הַדָּם כִּי הַדָּם הוּא הַנֶּפֶשׁ וְלֹא תֹאכַל הַנֶּפֶשׁ עִם הַבֶּשֶׂר:

But make sure that you do not partake of the blood; for the blood is the life, and you must not consume the life with the flesh.

d. Sifre Devarim, Re'eh (#76).

ולא תאכל הנפש עם הבשר, זה אבר מן החי, והלא דין הוא מה בשר בחלב שמותר לבני נח אסור לישראל אבר מן החי שאסור לבני נח אינו דין שאסור לישראל, יפת תואר וכל הדומים לה תוכיח שאסורה לבני נח ומותרת לישראל אף אתה אל תתמה על אבר מן החי שאף על פי שאסור לבני נח שיהא מותר לישראל תלמוד לומר ולא תאכל הנפש עם הבשר זה אבר מן החי, רבי חנניה בן גמליאל אומר זה הדם מן החי.

And thou shalt not eat the life with the flesh (12:23): This refers to a limb cut from a living animal. But is it not obvious that if flesh seethed in milk, which was permitted to all descendants of Noah, was (later) forbidden to Israel, the limbs of a living animal, which was forbidden to all descendants of Noah, should certainly be forbidden also to Israel? (Not necessarily so,) as evidenced by the case of the (captive) *woman of goodly form* (Deut. 21:11), who was forbidden to all descendants of Noah but was (later) permitted to Israel, and by other similar cases. You should therefore not be surprised if the limb of a living animal, too, were (later) permitted to Israel although previously prohibited to all descendants of Noah. Hence, *Thou shalt not eat the life with the flesh*, referring to the limb of a living animal. R. Hanina ben Gamliel, however says: This refers to the blood of a living animal.⁸⁷

⁸⁷ Translation taken from *Sifre: A Tannaitic Commentary on the Book of Deuteronomy*, Translated from the Hebrew by Reuven Hammer (New Haven: Yale UP, 1983), pp.130-131. In note 5, Rabbi Hammer refers to b. San. 56a and t. AZ 8:4ff for sources on the captive woman being permitted only to the initial Israelite conquerors of Canaan.

e. **Rabbi Yaakov b. Asher, Tur, Yoreh Deah 62.**

לא תאכל הנפש עם הבשר אזהרה לאוכל אבר מן החי ונוהג בבהמה וחיה ועוף ואינו נוהג אלא בטהורים לפיכך אבר הפורש מן החי בין שיש בו בשר וגידין ועצמות בין שאין בו אלא בשר לבד כגון הלשון והטחול והכליות והביצים אסור לאוכלו בין אם יש בו כזית בין אם אין בו כזית וכן בשר הפורש מן החי אסור אף על פי שאין בו משום אבר מן החי אסור משום ובשר בשדה טריפה לא תאכלו.

“You must not consume the life with the flesh” (Deut. 12:23). This warns not to eat a limb from a living animal. It applies to cattle, beasts and birds, but only to pure species. If a limb is removed from a living animal, whether it has flesh, sinews and bones, or whether it is only flesh, such as the tongue, spleen, kidneys and testicles, it is prohibited to eat it whether there is an olive’s bulk or not. And likewise flesh removed from a living animal is prohibited even if it is not considered to be a limb from a living creature; it is prohibited because of the verse, “you must not eat flesh torn by beasts in the field” (Ex. 22:30).

3. **Miracle Meat (!)**

a. **Talmud Bavli, Sanhedrin 59b.**

מי איכא בשר היורד מן השמים? - אין, כי הא דרבי שמעון בן חלפתא הוה קאזיל באורחא, פגעו בו הנך אריותא דהוו קא נהמי לאפיה, אמר: הכפירים שאגים לטרף. נחיתו ליה תרתי אטמתא, חדא אכלוה וחדא שבקוה. איתיה ואתא לבי מדרשא, בעי עלה: דבר טמא הוא זה או דבר טהור? - אמרו ליה: אין דבר טמא יורד מן השמים.

Is there really such a thing as meat from heaven? Yes, because of the time when Rabbi Shimon b. Halafta was walking on the road, and he was attacked by lions that were growling at him. He cited, “the lions roar for prey” (Psalms 104:21), and then two flanks of meat fell down for him. One, they [the lions] ate; the other, they left. He brought it with him to the House of Study and asked about it—is this item impure or is it pure? They said to him: Nothing impure comes from heaven!

b. **b. Sanhedrin 67b.**

אמר אביי: הלכות כשפים כהלכות שבת, יש מהן בסקילה, ויש מהן פטור אבל אסור, ויש מהן מותר לכתחלה. העושה מעשה - בסקילה, האוחז את העינים - פטור אבל אסור, מותר לכתחלה - כדרב חנינא ורב אושעיא. כל מעלי שבתא הוו עסקי בהלכות יצירה, ומיברי להו עיגלא תילתא ואכלי ליה.

Abaye taught: the laws of witchcraft are like the laws of Shabbat. Some acts are [forbidden and punished] by stoning, some are forbidden but exempt [from the death penalty], and some are permitted outright. [Regarding witchcraft] One who performs a spell—is punished with stoning; one who deceives the eyes—is forbidden but exempt. As for an act that is permitted outright, that is like the story of Rav Hanina and Rav Hoshaya: Every Sabbath eve they would study the [mystical] Book of Creation, and they would create for themselves a third-grown calf and they ate it.

c. Rabbi Isaiah Horowitz, Two Tablets of the Covenant שני לוחות הברית.

והנה מצינו בגמרא (סנהדרין סה ב) דברא עגלא תלתא בכל ערב שבת על ידי עסק ספר יצירה בצירוף השמות, ובודאי זה הנברא על פי השמות ולא מצד התולדה אין צריך שחיטה, וניתר לאוכלו בעודו חי, וכך עשו השבטים. ויוסף לא ידע והיה סבור שהוא הנולד מאב ואם, הביא דבה זו אל אביו שהם אוכלים אבר מן החי, והם כנים היו וכדין עשו.

Behold we find in the Gemara that they created a third-grown calf every Sabbath eve by means of the Book of Creation, by combining divine names. For sure this that was created by using names, and not by reproduction, does not require kosher slaughter, and it is permitted to eat it even alive, and this is what the tribes did [i.e. the brothers of Joseph]; but Joseph did not know and he thought it was born from a mother and father, and so he brought this evil report to his father that they were eating limb meat, but they were acting properly and legally.

d. Rabbi Meir Leibush ben Yehiel Michel Wisser, Malbim, Genesis 18:7.

וימהר לעשות אתו שעשה אותו ע"י ספר יצירה. נראה שרצו לתרץ בזה איך האכיל להמלאכים בב"ח, ואמרו שהיה בשר שנברא ע"י ספר יצירה שאין לו דין בשר, וז"ש שלקח חמאה וחלב וכן הבקר אשר עשה, ר"ל יען שעשאו ע"י ספר יצירה היו יכולים לאכלו עם חלב.

[Abraham] hurried to "make" [the calf]—by means of the Book of Creation. It appears that they wished to explain with this how [Abraham] could feed the angels meat and milk, and they said that the meat was created by means of the Book of Creation is not classified as meat. And when it says that he took butter and cream and the calf that he made, it means to say that because he made it through the Book of Creation, they could eat it with milk.

4. Modern Studies about Cultured Meat.

a. Rabbi Ze'ev Weitman, "Cultured Meat" in *Tehumin* v.36, p.459.

ולכאורה נראה, שהדברים כן דומים, שהרי בדיוק כמו שהאדמה מספקת לצמח את חומרי המזון הדרושים לו כדי להתפתח ולגדול כך בדיוק קורה גם בבשר המתורבת – שם הגידול וההתפתחות מתאפשרים הודות לחומרים המותרים שמזינים את התא ומשמישים לו מצע גידול, ואם הצמח שגדל ומתפתח מהזרע נחשב לפנים חדשות הרי נראה שהוא הדין גם הבשר הגדל ומתפתח מהתא יכול להיחשב כפנים חדשות. However, it appears that the matters are indeed comparable, for just as the earth provides a plant with the nutrients needed for it to grow and develop, exactly so with cultured meat—there the growth and development are made possible due to the materials that nourish the cell and serve it as a growth platform. And if a plant which grows and develops from a seed is considered to be a new entity (lit. *new face*) it would appear that so too meat which grows and develops from a cell may be considered like a new entity.